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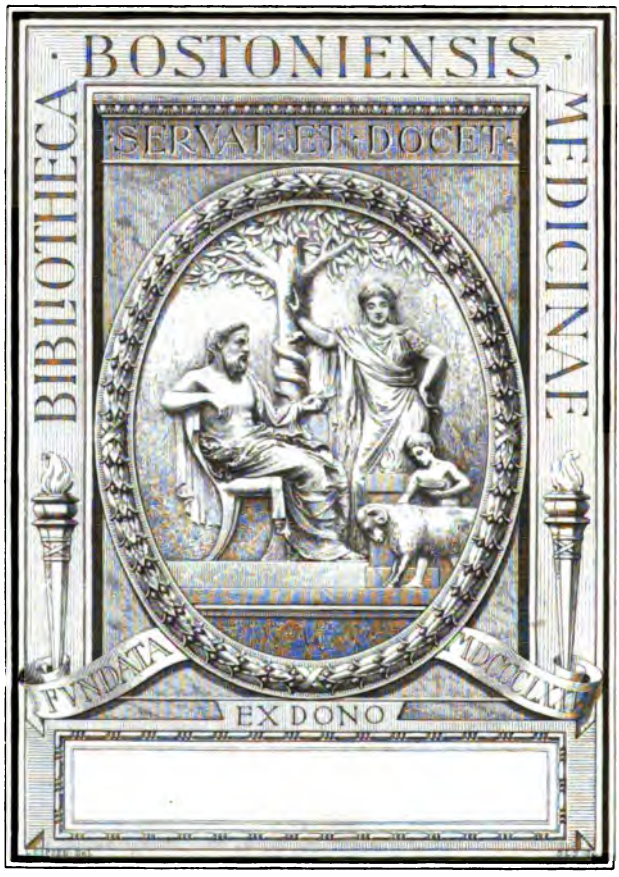
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CONTRIBUTORS TO VOLUME II.

CLARK, JOHN G., M.D.
COLEY, WILLIAM B., M.D.
FOOTE, EDWARD MILTON, M.D.
JACKSON, EDWARD, M.D.
STENGEL, ALFRED, M.D.

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PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES, AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES.

EDITED BY

HOBART AMORY HARE, M.D.,

PROFESSOR OF THERAPEUTICS AND MATERIA MEDICA IN THE JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA; PHYSICIAN TO THE JEFFERSON MEDICAL COLLEGE HOSPITAL; ONE TIME CLINICAL PROFESSOR OF DISEASES OF CHILDREN IN THE UNIVERSITY OF PENNSYLVANIA; MEMBER OF THE ASSOCIATION OF AMERICAN PHYSICIANS, ETC.

ASSISTED BY

H. R. M. LANDIS, M.D.,

VISITING PHYSICIAN TO THE TUBERCULOSIS DEPARTMENT OF THE PHILADELPHIA HOSPITAL, TO THE WHITE HAVEN SANATORIUM AND TO THE PHIPPS INSTITUTE; DEMONSTRATOR OF CLINICAL MEDICINE IN THE JEFFERSON MEDICAL COLLEGE.

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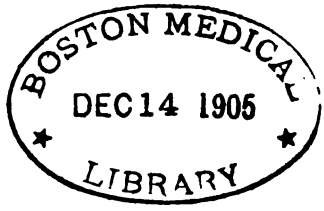

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LIST OF CONTRIBUTORS.

WILLIAM T. BELFIELD, M.D.,

Associate Professor of Surgery in the Rush Medical College; Professor of Genito-urinary and Venereal Diseases in the Chicago Polyclinic, Chicago.

JOSEPH C. BLOODGOOD, M.D.,

Associate in Surgery, Johns Hopkins University, Baltimore, Md.

JOHN ROSE BRADFORD, M.D., F.R.C.P., F.R.S.,

Professor of Medicine and Physician to the University College Hospital, London.

JOHN G. CLARK, M.D.,

Professor of Gynecology in the University of Pennsylvania, Philadelphia.

WILLIAM B. COLEY, M.D.,

Attending Surgeon to the General Memorial Hospital; Associate Surgeon to the Hospital for Ruptured and Crippled; Clinical Lecturer in Surgery and Instructor in Surgery at the College of Physicians and Surgeons, Columbia University, New York.

FLOYD M. CRANDALL, M.D.,

Adjunct Professor of Pediatrics, New York Polyclinic Hospital; Visiting Physician to the Minturn Hospital for Scarlet Fever and Diphtheria; Consulting Physician to the Infants' and Children's Hospitals, New York.

WILLIAM EWART, M.D., F.R.C.P.,

Physician to and Joint Lecturer on Medicine at St. George's Hospital, and Physician to the Belgrave Hospital for Children, London.

EDWARD MILTON FOOTE, M.D.,

Instructor in Surgery, Columbia University; Visiting Surgeon, New York City Hospital.

CHARLES H. FRAZIER, M.D.,

Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to the University, Howard, and Philadelphia Hospitals.

WILLIAM S. GOTTHEIL, M.D.,

Professor of Dermatology and Syphilology, New York School of Clinical Medicine; Consulting Dermatologist to the Sheltering Guardian Orphan Asylum; Dermatologist to the Lebanon and Beth Israel Hospital, and to the German West Side Dispensary, New York.

CHARLES PREVOST GRAYSON, A.M., M.D.,

Lecturer on Laryngology and Rhinology in the Medical Department of the University of Pennsylvania; Physician-in-Charge of the Department for Diseases of the Throat and Nose in the Hospital of the University of Pennsylvania ; Laryngologist and Otologist to the Philadelphia Hospital.

EDWARD JACKSON, M.D.,

Emeritus Professor of Ophthalmology in the Philadelphia Polyclinic.

H. R. M. LANDIS, M.D.,

Visiting Physician to the Tuberculosis Department of the Philadelphia Hospital, to the White Haven Sanatorium and to the Phipps Institute ; Demonstrator of Clinical Medicine in the Jefferson Medical College.

RICHARD C. NORRIS, M.D.,

Assistant Professor of Obstetrics in the Medical Department of the University of Pennsylvania, Philadelphia; Physician-in-Charge of Preston Retreat.

ROBERT B. PREBLE, A.B., M.D.,

Professor of Medicine in Northwestern University Medical School ; Attending Physician to Cook County, St. Luke's, Wesley, German, and Polyclinic Hospitals, etc., Chicago.

ROBERT L. RANDOLPH, M.D.,

Associate Professor of Ophthalmology and Otology in Johns Hopkins University, and Associate Ophthalmic and Aural Surgeon to Johns Hopkins Hospital, Baltimore, Md.

WILLIAM G. SPILLER, M.D.,

Professor of Neuropathology and Associate Professor of Neurology in the University of Pennsylvania ; Clinical Professor of Nervous Diseases in the Woman's Medical College of Pennsylvania and in the Philadelphia Polyclinic.

J. DUTTON STEELE, M.D.,

Associate in Medicine, University of Pennsylvania.

ALFRED STENGEL, M.D.,

Professor of Clinical Medicine in the University of Pennsylvania, Philadelphia.

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PROGRESSIVE MEDICINE.

JUNE, 1905.

HERNIA.

By WILLIAM B. COLEY, M.D.

The Treatment of Hernia Associated with Undescended Testis is beginning to receive more and more attention. The most important contribution to this subject is that of Odiorne and Simmons,[1] of Boston, being a study of 77 cases.

Of the 77 cases reported 15 were double, 39 of the right side, and 23 of the left. There were 17 examples of abdominal retention, 51 of inguinal, 18 of pubic, 5 puboscrotal, 1 subcutaneous above the external ring, or inguinosuperficial. In all cases there was a certain amount of atrophy present.

According to Marshall's statistics the frequency of undescended testis is about 1 in 900, which estimate is based upon examination of 10,000 recruits.

The frequent complication of hernia with undescended testis is shown by Odiorne and Simmons' cases in 57 per cent. of which a hernia was present.

Of 49,859 cases of hernia observed at the Hospital for Ruptured and Crippled between 1891–1902, 400 were associated with undescended testis.

Of 48,000 cases of hernia in the male, observed by Eccles, 854 were associated with undescended testis.

The question of the liability of undescended testes becoming the seat of malignant disease is discussed. A number of the older authors are quoted in proof of the belief that the undescended testis is a source of great danger by reason of this tendency to become the seat of a sarcoma. Fischer, in 1904, was able to collect 39 such cases.

In a series of 54 cases of malignant disease of the testis observed at the Massachusetts General Hospital during a period of twenty-six years, there were 6 cases with sarcoma starting in an undescended testis, or 11 per cent. Odiorne and Simmons state that Schaedel, quoted by

[1] Annals of Surgery, December, 1904.

von Kahlden, reported that in a large London Hospital, in one year, 41 cases of malignant disease were seen, 5 of which were in undescended testicles, or 12 per cent.

I believe that there must be an error regarding the last statement, inasmuch as it is quite unreasonable to suppose that 41 cases of such a rare condition as malignant disease of the testicle should have been observed in a single hospital in a single year, especially as only 54 cases were observed in twenty-six years in such a large hospital as the Massachusetts General, and one drawing material from the greater portion of New England.

On the other hand, Eccles who has probably made a more careful study of the undescended testis than any other writer, believes that we have not sufficient proof to assert that sarcoma occurs more frequently in undescended than in the descended testis.

My own experience within the last fifteen years at the Hospital for Ruptured and Crippled confirms the opinion of Eccles, inasmuch as in nearly 60,000 cases of hernia not a single case of sarcoma due to undescended testis has been observed. Of 26 cases of sarcoma of the testis personally observed, the first 24 occurred in men with fully descended testes. Strange to say, in the twenty-fifth and twenty-sixth case the disease had its origin in an undescended testis, one of inguinal, the other of abdominal retention.

As regards the treatment of hernia associated with undescended testis, Odiorne and Simmons believe that no child with double undescended testis should be allowed to reach the age of puberty without an effort having been made to bring the organs into their normal position, the reason being that, if this is not done, the individual will probably remain sterile for life. Unlike Corner, McAdam Eccles, and others, Odiorne and Simmons believe that the influence of an undescended testis upon the development of the male characteristics may be exerted whether the testis be descended or not, but that the function of spermatogenesis seems to depend upon a more or less normal position of the testis. They believe that in operations upon children both organs should not be placed in the abdominal cavity, for such testicles are invariably functionless and in no case, single or double in children, should orchidectomy be done, unless the testis is hopelessly degenerated. If in adults with double arrest an attempt at orchidopexy is unsuccessful the organs may be returned to the abdominal cavity. Removal of one testis should be done only as a last resort and castration is never justifiable. For abdominal retention no treatment is indicated. They believe that orchidopexy is the operation of choice in children.

As regards the results of this procedure, Broca has reported 138 cases; 79 were traced for one year; 31 of these were normal in size and

position; 35 normal in size, but high in the scrotum; 13 were atrophied. All of Broca's cases were in young children.

In Odiorne and Simmons' cases 24 orchidopexies were done on 22 patients; 7 of these were under fourteen years of age; perfect results were obtained in but two instances. In 11 operations upon adults from sixteen to fourty-two years of age five testicles have remained in the scrotum, four of them occupying a high position in it, the other an almost perfect position. Three retracted soon after operation into the canals, one of them causing much pain. It is said that in every case in which the organ appeared normal at the time of operation, there was a subsequent diminution in size. In no case has there been a recurrence of a complicating hernia.

Personally, I have operated upon 70 cases of undescended testis, 20 of these were adults from fifteen to forty years; 48 were children under the age of fifteen years. Twelve adult cases have been observed from one to six years; 19 children from three to eight years. There has been no return of the hernia in any case. In the majority of the cases the testis has retracted to the upper portion of the scrotum or just outside of the external ring. In a number of cases the organ has remained in place, but my final statistics as regards the position of the testes are not yet completed.

The Operative Treatment of Hernia in Infants and Young Children has recently been very thoroughly discussed by H. J. Stiles,[1] of Edinburgh, who reports 360 consecutive operations, 26 per cent. of which number were in infants below the age of one year. He states that of the total number of surgical cases seen at the Royal Edinburgh Hospital for Sick Children, 7 per cent. suffered from inguinal hernia. He is exceedingly skeptical as to the value of mechanical treatment in infants, and states that by careful rolling the cord between the forefinger and thumb he has almost invariably been able to satisy himself of an empty sac in cases in which the hernia was supposed to have been cured, and in quite a number of instances the bowel had, as the result of some extra strain, or an attack of whooping-cough, actually descended into the sac.

The hernial sac in children or young infants is extremely thin and delicate—as thin as the thinnest tissue paper—so that it would seem a very difficult matter to detect the presence of such a sac; still more difficult would it be to determine whether or not a portion of it had been obliterated.

Stiles believes that it is just in those cases in which the hernia is supposed to have been cured by a truss during childhood that strangulation is likely to occur in young adult life as a result of some severe strain,

[1] British Medical Journal, October 1, 1904, No. 2283, p. 812.

and he believes that the mortality of strangulation in such cases is greater than the death rate from radical operation during infancy and childhood.

This raises a most interesting question, but I believe that it is one that it is difficult to answer with our present data. Stiles goes farther than almost any other writer upon the subject of the radical cure of hernia in recommending and urging operation in young infants. He states that he had not used a truss in the Royal Edinburgh Hospital for Sick Children for the last four or five years, and in private practice he has used a truss only when parents have refused operation which he invariably recommends, provided the child's condition of health will warrant it. His reasons for extending the limits of operation to infants and very young children are, that the operation is practically free from risk, is not followed by recurrence, and no truss is needed after operation. Furthermore, that by operation we are able to cure the rupture in a fortnight, while a truss may require one or several years with the probability of failure in the end. As regards the age of patients, he believes that the operation is practically as safe in the young infant as it is later on. If asked at what age he would prefer to operate he would say "just before teething." In a young and delicate infant with a rupture appearing a few weeks after birth, he would wait a month or two to see what happens, but in the interval would not use a truss.

This teaching I believe to be altogether too radical. I think Stiles has greatly underestimated the number of cures from mechanical treatment during infancy. De Garmo, whose experience not only with the mechanical treatment of hernia but also with its operative treatment, has been surpassed by few, believes that 90 per cent. of children under the age of three are cured by truss. While personally I would not place the estimate quite so high, I believe that more than half of the cases under three years of age are cured by truss and a much higher percentage under the age of one year. No doubt some of these supposed cures do recur later in life, but I believe it far better to operate upon these few cases when they reappear than to subject the entire number to operation during the period of early infancy. Only a few days ago I examined a child two years of age in whom a very large scrotal hernia appeared when the child was four weeks old. The hernia was reduced with great difficulty and a truss immediately applied has been worn ever since. The hernia has never been seen from the time the truss was first applied, and at present there is no impulse on coughing. The most important objection to operating upon infants under the age of one year is that it has not yet been proven that the operation in such cases is free from risk. Stiles' own cases furnish evidence to the contrary. He reports 5 deaths in his 360 operations, 3 in his first 100. I

believe it much wiser to try mechanical treatment up to the age of three to four years. After that age the risk attached to the operation is less and the chances of a cure by truss treatment are also decidedly less. I personally have operated upon 840 cases of children, all over the age of four years, with the exception of 11 cases of strangulation, with only a single death, due to ether pneumonia.

Stiles reports an unusual number of interesting cases in his list, among which are 24 cases in which the cæcum was found in the sac, or 7 per cent., and in 5 out of 36 cases of inguinal hernia in girls the sac contained the ovary and Fallopian tube, a remarkably high percentage. The method of operation employed by Stiles is practically the operation introduced by Sir Mitchell Banks. It consists in brief in the isolation of the ligature at the neck of the sac at a level with the internal ring, without splitting up the aponeurosis of the external oblique as in Bassini's operation. For the closure of the canal Stiles believes that all that is necessary in the majority of cases is to introduce a single catgut suture through the outer pillar close to Poupart's ligament across the canal, superficial to the cord and then from within outward, through the conjoined tendon and the inner pillar of the ring.

This method differs very little from the old Czerny method and the results of the same in a small series of cases performed at the Hospital for Ruptured and Crippled in 1888 to 1890 show a large percentage of recurrences. I do not believe it to be equal to Bassini's method even in children. In regard to the wound treatment and after-treatment, Stiles advances some novel ideas. The treatment which he believes gives the best results in infants and young children is that in which the sutured wound apart from being smeared over with iodoform and thickly dusted with boracic acid powder, is left exposed without the application of any dressing. The infant is kept flat on its back by means of a strap passed behind the shoulders and through the armholes of a flannel band, passing across the front of the chest; the ends of the strap are carried under the frame of the bed, where they are tied. A small draw-sheet is folded into four layers and placed under the pelvis to receive the feces. The horsehair sutures of the skin are removed on the sixth or seventh day, and the infant is generally sent home on the eighth to ninth day. Stiles states that in the last 100 cases treated in this way there was only one suppuration. With this method of after-treatment he has come to regard the radical cure of hernia in infants as an operation giving less trouble than circumcision.

Personally, I believe that the method adopted at the Hospital for Ruptured and Crippled fourteen years ago, and used constantly since, of applying a plaster-of-Paris splint from the chest to the knee, is simpler and more comfortable to the patient. While our experience with young

infants is not large, we have applied the same method in all the cases of strangulated hernia, the youngest being thirteen days old, and primary wound healing occurred in every case. The fear of the wounds becoming contaminated with urine in infants and young children has been very greatly exaggerated. With a plaster-of-Paris dressing carefully applied over the aseptic dressing the urine rarely gains access to the wound, and when it does it practically never produces suppuration.

As regards recurrences, Stiles does not give any statistics, stating that some of his cases have been too recently operated upon to be of value in this respect.

Radical Cure of Oblique Inguinal Hernia. Kennedy[1] gives the remote results of operations for the radical cure of oblique inguinal hernia in 103 cases. He states that after having practised Macewen's, Kocher's, and Bassini's methods, he has for several years made use of an operation different from all of these. His objections to Macewen's method are: 1. The treatment of the sac. 2. Imperfect closure of the canal.

His objection to Kocher's method is that the deeper structures are not touched and that the superficial structures do not make an efficient closure. Although he admits that Bassini's method has obtained almost universal favor, he believes there are objections which should prevent its adoption. First of these, he states, is "that the external oblique is split in order to reach the internal oblique and transversalis for the purpose of stitching them to the inner aspect of Poupart's ligament." He further states that no matter how perfectly the external oblique tendon is repaired after the deeper stitching is done, in the event of recurrence the scar in the external oblique tendon is almost sure to dilate, thus giving rise to a direct or ventral hernia rather than oblique. His experience with Bassini's operation seems to be based upon a study of 10 cases, 8 of which were traced, with 2 relapses—an experience manifestly too limited to justify an authoritative opinion as to the value of the method.

In regard to the objection raised as to the impossibility of perfectly repairing the cut edges of the aponeurosis of the external oblique, it seems to me that this is not borne out by the facts. The main point at issue when discussing the relative merits of the various operations for the radical cure of hernia is the efficiency of the method in obtaining a radical cure. If, as has been proven, Bassini's operation when properly done, cures the hernia in 99 per cent of the cases—a considerably greater percentage than obtained with any other method—it seems to me the question of whether a possible recurrence is direct or indirect is of minor importance.

My own experience in nearly 1400 cases of operation for the radical

[1] British Medical Journal, October 1, 1904, p. 817

cure of hernia by Bassini's method shows that perfect repair of the external aponeurosis does take place, and in many of these cases, examined more than ten years after operation, the aponeurosis was found quite as firm on the one side as on the other.

In the operation advocated by Kennedy, the sac is dealt with by Kocher's latest method. It is invaginated into the abdomen and brought out through the abdominal wall. The ligature is then cut off and the internal oblique and transversalis are stitched to the deep aspect of Poupart's ligament, but without cutting the external oblique tendon. The cord is not transplanted.

Personally I believe it is quite possible to make an accurate suture of the internal oblique muscle to Poupart's ligament without cutting up the aponeurosis of the external oblique, and I do not believe that the theoretical objection raised to the cutting of the external oblique warrants us in rejecting a procedure which, in practice, has proven entirely efficient.

Kennedy gives the results of operation in 103 cases operated upon more than a year ago; 96 were males, 7 females, and the youngest (for strangulation) was six months of age, the oldest seventy-four years. Twenty operations were done in patients from six months to three years of age. In 45.6 per cent. of the cases the sac was of the congenital type. Six cases were cæcal hernia and 1 hernia of the ovary. The mortality was really *nil*, since the only death in the series, occurring some weeks after operation as a result of tuberculous meningitis, can hardly be called an operative death.

The older cases, 20 in number, were operated upon by Macewen's method, all within the last five to seven years. Eleven of these cases were traced, with 2 relapses. Seventy cases were operated upon by the author's method, 54 of which were traced from one to five years, with only 1 relapse.

The Pathology and Treatment of Hernia in Children has been discussed in a most able and conservative way by Corner,[1] of London. Contrary to Stiles, Corner believes in the curability of hernia in young children by means of a truss. He states that the most popular truss for babies and young children is the worsted truss, or the one constructed from a skein of wool, but he adds that it requires little experience to demonstrate the general inefficacy of this form of truss.

I have frequently alluded to the great inferiority of the worsted truss to the spring truss.

With regard to the treatment of undescended testis in connection with hernia in children, Corner agrees with the opinion of McAdam

[1] Lancet, August 20, 1904.

Eccles, and others that, entirely aside from the functional value of the undescended testis, such testes, by reason of some internal secretion, have a very important bearing upon the development of the male characteristics, and he adds, "If one studies the people with imperfectly descended testes the conclusion that one must come to is that the perfection of the male characteristics may be estimated by the amount of perfect testicular tissue present." He believes that the fact must be recognized that the production of spermatozoa is but one of the functions of the testes.

Corner considers it practically impossible to cure by means of a truss a hernia which has a congenital sac—*i. e.*, one in which the tunica vaginalis is continuous with the peritoneum.

He believes in treating children under the age of four to five years with a truss, excepting (*a*) in large or uncontrollable hernia; (*b*) in irreducible, difficultly reducible, or incarcerated hernia; (*c*) in strangulated hernia. At the age of about four years he thinks that all children should be operated upon unless there be special contraindications, such as (*a*) congenital sac (operation now being performed at the age of election); (*b*) imperfectly descended testis; and (*c*) if the hernia has been, and apparently will be, persistent in character.

The Results of Fifteen Hundred Operations for the Radical Cure of Hernia in Children, performed at the Hospital for Ruptured and Crippled between 1891 and 1904, have been reported by Dr. Wm. T. Bull and myself[1] in a paper read before the New York State Medical Association in October, 1904. Of 53,686 patients treated in the out-patient department of the hospital within the period stated, 50,961 were inguinal and 2725 femoral. Almost one-third of these cases, namely, 15,375, were children below the age of fourteen years. From December, 1891, to October, 1904, 1500 operations have been performed at the Hospital for Ruptured and Crippled for the radical cure of hernia, all of which, with the exception of 20, were in patients under fourteen years of age. These cases represent the worst cases of rupture, and in most instances a truss had been tried and failed. They are distributed over the various varieties as follows: 1435 operations for inguinal hernia; 39 for femoral; 13 for umbilical; 8 for ventral; 2 for congenital hernia of the umbilical cord; 2 for epigastric hernia; 1 for lumbar hernia, making a total of 1500 operations. Of this number 13 were strangulated, leaving 1487 non-strangulated cases.

The results of operation having shown that the question of mortality has been practically eliminated, we have of late adopted the plan of advising operation in most cases of hernia in children past the age of

[1] Medical Record, March 18, 1905.

four years, unless the hernia be very small. This plan is especially followed in dispensary cases in which it is so difficult to get the truss properly looked after at home.

Of the 1435 operations for inguinal hernia, 251 were performed upon 217 female patients, with no death and no relapse. The method employed is practically identical with Bassini's operation in the male, the round ligament being allowed to drop back into the lower angle of the wound without transplantation.

The method of operation employed in the great majority of cases of inguinal hernia in the male was Bassini's, the only change in the technique having been the substitution of kangaroo tendon for silk in the buried sutures, and that in most cases a suture was placed above the cord in addition to those below. In 125 cases the cord was not transplanted, but brought out at the lower angle of the wound and the external oblique being sutured to Poupart's ligament—exactly the same as in inguinal hernia in the female. This method is known in Germany as Wölfler's method without transplantation of the rectus muscle. In this country it is frequently known as Ferguson's method. Wölfler's cases were not reported until 1895, Ferguson's in 1899.

The first cases operated upon by Dr. Bull and myself[1] at the Hospital for Ruptured and Crippled occurred in 1892, and were reported in 1895. The results in these 125 cases operated upon at the Hospital for Ruptured and Crippled while very good, are not equal to those following operations in which the cord was transplanted.

Although femoral hernia is supposed to be very rare in children, we have operated upon 39 such cases at the Hospital for Ruptured and Crippled, 28 of which were in children below fourteen years of age, the youngest being two years old. Of 2179 cases of femoral hernia observed at the hospital since 1890, 69 occurred in children under fourteen years of age, or a little over 3 per cent.

The method employed in most cases has been that of high ligation of the hernial sac with a purse-string suture of kangaroo tendon, bringing the floor of the canal in contact with the roof.

Thirteen of the cases were traced from two to eight years without a single relapse.

In 85 cases an undescended or partially descended testis complicated the operation.

Up to recently we have advised against operation in hernia with undescended testes in infants and young children up to the age of eight or ten years unless the hernia was of large size; the reason for this being that the testis often descends of itself if left alone and no truss is applied.

[1] Annals of Surgery, 1895.

The rupture is not likely to become strangulated, as the testes prevent the intestine from getting outside the external ring, which we have shown to be the cause of strangulation in children. Inasmuch as an operation for the cure of the hernia is nearly always necessary, even after the testis has come down, we do not now postpone operation quite as long as formerly.

As regards operation, we now employ Bassini's method without transplanting the cord, thereby gaining an appreciable lengthening of the latter and securing the testis a lower position in the scrotum. While it is of great importance to thoroughly free the cord, sacrificing some of the veins, if needs be, and cutting away the fascia about the veins, we think the step advised by Bevan of separating the veins high up in the iliac fossa by blunt dissection with the index finger likely to involve risk of severe hemorrhage. It is very important to so close the opening at the external ring that the testis cannot re-enter the canal even if it should retract thus far. While we have not observed any relapses in this class of cases, the testis has retracted to the external ring in a considerable number of cases, especially the earlier ones.

Strangulated Hernia in Children. We have found strangulation to be much more common during the first two years of life than during the next decade. Of 13 operations performed for strangulated hernia in children between the ages of thirteen days and fifteen years, 5 were under one year and 7 under two years. Only one case of strangulation was observed between the ages of three and a half and fourteen years. The mortality of operation in this series has been *nil.*

Umbilical Hernia in Children. Practically all cases of umbilical hernia in children may be cured by mechanical means. The method employed by us consists in applying a two-inch strip of zinc oxide rubber adhesive plaster which entirely encircles the abdomen and holds in place a small pad, usually made of a wooden button mould one inch in diameter and covered with adhesive plaster. This is changed once every one or two weeks. Ordinary cases are cured in about a year.

In the few cases of umbilical hernia in which operation was indicated we have found that closure of the wound in three layers, without any overlapping, has been sufficient to effect a cure. Thus far we have observed no relapses in this group of cases.

Results. Six hundred and one cases of hernia in children have remained sound from one to twelve years; 651 from six months to twelve years. In 1076 cases of inguinal hernia in the male operated upon by Bassini's method since December, 1890, there have been 6 relapses; in 125 cases in which the cord was not transplanted, 5 recurrences have been observed. In 251 operations for inguinal hernia in the females no relapses have been noted

The mortality in the above reported series has been 0.26 per cent. (4 deaths in 1500 cases).

Radical Cure of Hernia. Hilgenreiner[1] publishes a report covering 828 operations for the radical cure of hernia performed at Wölfler's clinic, Prague, from 1895 to 1902. He prefaces his remarks by referring to the statistics of Berger, who on a basis of 10,000 examinations declared hernia to be present in 7 per cent. of the male and 2 per cent. of the female population, a proportion which entitles hernia to front rank among surgical diseases and fully justifies the importance that is given the discussion of operative measures devised for its cure.

The 828 operations covered by Hilgenreiner's report were performed upon 770 patients; of these 471 were free herniæ and 357 strangulated. Of the non-strangulated 374 were observed in men, 46 in women, while of the strangulated cases 149 were men and 205 women.

A table showing the time of development of the hernia in the cases treated at the Prague clinic shows that while inguinal hernia is frequently enough congenital, or acquired in early life, femoral and umbilical hernia at this stage are comparatively rare.

Regarding hereditary predisposition, Hilgenreiner states that 122 of 267 cases questioned regarding this point gave a history of heredity. He believes, however, that if the true facts were known in all cases, this percentage would be found to be considerably larger. Nussbaum estimated two-thirds of all herniæ to be hereditary, while Berger in 7542 cases found only 2079, equal to 27.05 per cent. hereditary.

The operation for non-strangulated inguinal hernia was performed 446 times in 397 patients; that for femoral hernia 15 times in 13 patients. The hernia was right-sided in 273 instances, left-sided in 188.

As to the duration of the hernia prior to operation it is stated that in 444 cases in which such information could be obtained, the hernia had existed less than a year in 133 cases; from one to ten years in 227 cases, longer than ten years in 84.

Of the inguinal herniæ 77 were bilateral; twice a femoral hernia existed on the same side; 36 were irreducible omental hernia; more or less pronounced ectopia or undescended testis was seen in 21 cases, 6 times associated with atrophy of the testis.

The closure of the hernial opening was attempted in various ways. In 33 cases operated upon during the first two years, Frey's method (transplantation of the cord into a slit of Poupart's ligament) was employed; in 17 cases closure was obtained by a simple suture, according to Czerny, in a very few according to Bassini, and in all the remaining cases Wölfler's method was practised.

[1] Beiträge z. klin. Chir., 1903–04, Bd. xli. p. 373.

Hilgenreiner calls attention to a common error with regard to the technique of Wölfler's method. He states that some of the steps of the operation were conceived by Wölfler almost simultaneously with, although entirely independently from, that of Bassini, in 1888. Wölfler's method differs from Bassini's, as he does not transplant the cord, but allows the same to remain in its normal position, utilizing the rectus muscle to strengthen the anterior wall of the canal. Although of 209 previously published cases the cord was transplanted only in 6 cases, the step being promptly discarded as being unpractical and superfluous; transplantation of the cord is always described as the essential feature of Wölfler's method, while in reality it is about the only distinguishing feature of Wölfler's from Bassini's operation, all other steps being practically the same.

As to wound healing, we find that of 435 operations for free herniæ, primary union was obtained in 383 cases; 52 cases healed by secondary union. While in 1895–96 primary union was seen in only 30 out of 57 cases, in 1900–01 only 2 of 186 cases healed by secondary intention. Rubber gloves are now worn by both operators and assistants.

Of 299 cases traced—*i. e.*, 77 upward of one year, the remainder from two to seven years, 266 were permanently cured, in 28 a relapse was noticed. In the 33 cases operated upon according to Frey and Czerny there were 7 relapses; in 94 cases operated upon according to Wölfler, without transposition of the rectus muscle, 8 relapses; in 163 operated upon by Wölfler's method with transposition of the rectus, 11 recurrences were noted. Of the 4 Bassini operations done, 2 relapsed. Counting only those of the cases traced upward of two years and that were operated upon by Wölfler's method with transplantation of the rectus, we find 98 cases with 7 relapses, equal to 7.1 per cent. These relapses occurred almost throughout in individuals with pronounced hereditary or individual predisposition; in only 2 cases could a direct cause for the relapse be assigned. It is furthermore stated that the relapses were noted only in adult men; among the re-examined 14 women and 25 male and female children up to the age of fifteen years there was no relapse. Goldner's statistics (1895 to 1900) showed 7.5 per cent. of recurrences after Bassini's operation in 446 cases traced. It must be remembered, however, as Hilgenreiner points out, that Goldner's material was vastly more favorable than theirs, since the former operated bilaterally in all cases of inguinal hernia, which accounts for his 800 radical operations in 476 patients; while at the Prague clinic they did only 471 operations in 420 patients.

Pott, in his collective statistics covering 1713 cases operated upon by Bassini's method, gives 9.9 per cent. relapses.

The mortality of operation in the non-strangulated cases during the

first six years covered by Hilgenreiner's report was 0. Within the last year one patient succumbed to postoperative pneumonia on the tenth day after operation, the wound having healed by primary union. This would give a death rate of 0.23 per cent. in 421 cases operated upon.

Potts gives a mortality of 0.7 per cent. in his collection of 2401 cases operated upon since 1895.

Hilgenreiner believes that the advantages of Wölfler's operation over that of Bassini's lies principally in the fact that he (Wölfler) allows the cord to remain in place, which not only greatly simplifies the procedure, but also avoids complications arising from injuries done to the cord or vessels. Inflammatory processes and atrophy of the scrotum, tearing of the vas deferens, gangrene of the scrotum, etc., all disturbances frequently mentioned in statistics of Bassini's operation, never occur after Wölfler's operation. Personally, I have never seen any of these complications after Bassini's operation, and see no reason why they should occur.

With regard to non-strangulated femoral hernia, only 15 operations in 14 patients were performed at the Prague clinic. Frey's method was employed, the same consisting in freeing, ligature, and extirpation of the sac; suture of hernial opening so as to fix the exposed inner third of Poupart's ligament which is easily pulled downward and backward to the likewise exposed pectineal muscle or pectineal fascia and periosteum of the horizontal ramus of the pubis by means of a few sutures. All operations were successful, and so far as could be ascertained no relapses occurred.

Of the non-strangulated umbilical hernia, 5 in number (4 female, 1 male), 4 were re-examined two years after operation; 2 were found permanently cured, while in the other 2 a slight recurrence was observed.

The number of incarcerated herniæ observed at the Prague clinic within the eight years covered by the report is 362 in 354 patients. Of these 5 died prior to treatment, so that only 349 patients with 357 strangulations were treated.

The proportion of the inguinal, femoral, and umbilical herniæ was about as 10:7:1 (208, 134, 20). Two hundred and sixty-one, or almost three-fourths of the total number of incarcerations occurred in patients above forty years of age; the youngest case was that of a boy four years of age, the oldest a woman of eighty-seven. In both cases primary resection of the gangrenous intestine was successfully done.

As to the participation of the sexes, it is stated that 202 were women, 160 men. Adding to these the cases reported by Berger, it appears that the disposition to strangulation is more than four times as great in women as in men, which difference is explained by the predominance in women of femoral and umbilical hernia (91 per cent. and 84 per cent.),

in which variety strangulation is much more frequent than in inguinal hernia.

In 257 cases the contents of the sac is stated. In 48.6 per cent. it was the small intestine; in 28.8 per cent. small intestine and omentum; in 14.8 per cent. omentum alone; the remaining 7.8 per cent. were cases with rare contents of sac.

While Hilgenreiner points out the dangers of forced taxis, he believes it justified in recently strangulated herniæ of long standing, especially if the patients are well advanced in years. He reports 66 cases treated in this way without mortality. Simple herniotomy was performed 206 times (116 inguinal, 79 crural, and 11 umbilical), with a mortality of 11 per cent. It should be stated, though, that the mortality decreased from almost 36 per cent. in the first year of his report to 5 to 6 per cent. in the last two years.

In cases of gangrene of the intestine, primary resection with Murphy's button for the anastomosis was the routine procedure. The mortality in 55 cases of primary resection was 45.4 per cent.

The establishment of an artificial anus with secondary resection of the intestine was resorted to only in desperate cases with fecal abscess or phlegmon. Only 1 out of 11 recovered, 8 dying even before secondary resection could be done.

In the entire series of 357 cases of strangulated hernia reported by Hilgenreiner, there were 67 deaths equal to 18.7 per cent. Forty-four of these were gangrenous or suspected to be so; 23 per cent. non-gangrenous herniæ, giving for the former, 85 in number, a mortality of 51.7 per cent.; for the latter, comprising 272 cases, 8.5 per cent.

Hilgenreiner in his somewhat lengthy criticism of my results published in the *Transactions of the American Surgical Association*, 1903, states that most of my material was in children, in which his own statistics show no relapses.

While I am willing to admit that the results in children ought to be slightly better than in adults, Hilgenreiner's statistics show that of 294 cases traced at Wölfler's clinic only 14 were children under the age of ten years, a number manifestly too small to form any conclusions as regards the percentage of permanent cures. Sixty-one of the cases were from eleven to twenty years of age, 146 from twenty to thirty years of age, or 207 cases from eleven to thirty years of age, at which period of life the results have been almost, if not quite, as good as those in children under the age of fourteen years. Only 33 of the cases traced were over forty years of age.

Up to the present time I have operated upon nearly 1500 cases of inguinal and femoral hernia, of which more than 580 occurred in adults, and the results in adults are almost as satisfactory as those

obtained in children. Sixty of these were femoral hernia, with 1 relapse, leaving 450 cases operated upon by Bassini's method with seven relapses In my operations for hernia in children operated upon by Bassini's method, over 800 in number, I have had only three relapses.

The results of operation for the radical cure of hernia at the Heidelberg clinic[1] during 1902 and 1903 are of interest. In 1902 they operated upon 185 cases, 128 male, 51 female, and 6 doubtful; 112 were for non-strangulated inguinal hernia, 103 males, 9 female; 17 were incarcerated, 29 were femoral, 11 reducible, 18 strangulated.

As regards the method of operation, it is stated that Bottini's method was used in 70 cases of inguinal hernia; Czerny's in 31, and Kocher's in 1. There were no deaths in the non-strangulated cases; 3 deaths in the strangulated cases.

As regards wound healing, we find that in 198 operations performed there was suppuration, superficial and deep, in 31 cases.

Non-absorbable Suture Material. The objections to the use of a non-absorbable suture material for the radical cure of hernia, as frequently pointed out by me, have been strongly emphasized anew by Macewen in his address in "Surgery" before the last meeting of the British Medical Association.[2] He says: "Some conceive the idea that it would be good to have a material by the aid of which the parts could not only be brought together, but one which would keep them in permanent contact. At the present moment many investigators content themselves by aiming at a sterilized material for sutures and ligatures, believing that asepticity is the sole requirement."

Macewen believes that asepticity is only one of the requirements, a further one being that the sutures should remain in the tissues for time sufficient to effect their purpose and then be eliminated as rapidly as possible. These requirements apply to ligatures as well as sutures. If a suture remains longer than sufficient to accomplish its purpose, it is simply useless, dead material, capable of producing irritation. He adds, "some surgeons have introduced wire sutures in the belief that they would be able to bring together and maintain in apposition tendinous and aponeurotic structures in inguinal hernia." And as an illustration of the futility of such hope he gives his own experience in 5 cases in which gold wire had been used by other surgeons, the cases later coming under his own observation, 3 for recurrence of the hernia and 2 for strangulation. In three instances the wire was found lying loosely in the tissues and quite free from the aponeurosis which it had been introduced to maintain in contact. In 1 case it was embedded in granulation tissue so near the surface that it was clearly about to be

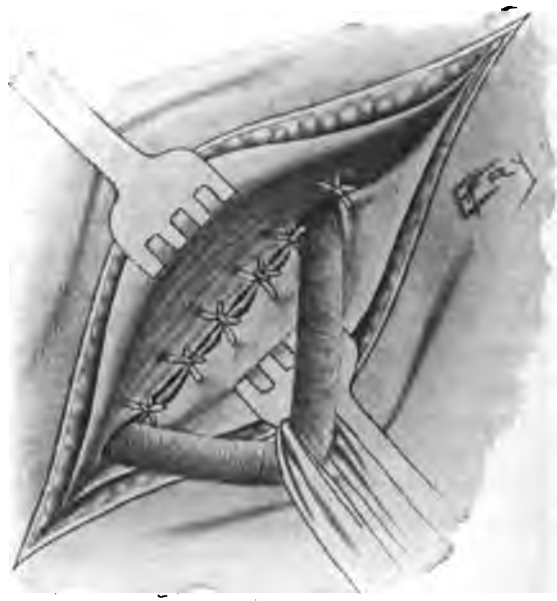
[1] Beiträge f. klin. Chir., 1904

[2] Lancet, August 6, 1904.

extruded. In the 2 cases of strangulated hernia a loop of wire which had been introduced through the aponeurosis at the first operation was found free and the bowel had passed right through the loop and become strangulated and constricted as if in a tight ring. In one of these cases perforation had occurred at the point of constriction by the wire.

My own experience at the Hospital for Ruptured and Crippled in upward of 30 cases has already been referred to in previous numbers of PROGRESSIVE MEDICINE. These cases together with Macewen's

FIG. 1.



Bassini's operation (deep sutures), showing extra suture above the cord. (COLEY.)

furnish very strong reasons, I believe, for abandoning non-absorbable sutures in operations for hernia.

Management of Hernia in Infancy and Childhood. In a paper[1] read before the Section on Diseases of Children of the American Medical Association, in June last, I have fully stated my views as to the treatment, both mechanical and operative, of hernia in children.

The method employed in most of the operative cases was the Bassini method, with the modification of first placing one suture above the

[1] The Management of Hernia in Infancy and Childhood, with Results of Operative Treatment, Journal of the American Medical Association, January, 1905.

cord (Fig. 1) in addition to those below, to prevent any widening of the internal ring in an upward direction, and of substituting for the buried silk sutures used by Bassini absorbable sutures—*i. e.*, chromicized kangaroo tendon.

After the sac has been tied off well beyond the neck, at a point where it has begun to widen out into the general peritoneal cavity, the deep layer of sutures is placed as follows: With a small tape the cord is held up and the first suture is placed so that it just touches the lower border of the cord when the latter is brought vertically to the plane of the abdomen; three to four more through the internal oblique and Poupart's ligament will suffice to close the canal to the symphysis pubis. Then the suture above the cord (Fig. 1) is inserted. This is not a part of Bassini's technique, but I believe it is of decided aid in preventing a relapse, as it strengthens the only weak point in the operation. The incision in the aponeurosis is then closed from above downward by a small continuous suture of kangaroo tendon and the skin with catgut. No drainage is used, and the wound is dressed very carefully with sterile gauze, cotton, a firmly applied spica bandage, and finally a plaster-of-Paris spica is applied to give perfect rest to the parts. The wound is dressed the seventh day, and the patients are kept in bed two weeks and allowed to go out in from two and one-half to three weeks, wearing a spica bandage until four weeks have elapsed, after which time no support is worn.

Autoplastic Sutures in Hernia. Dr. L. L. McArthur,[1] of Chicago, still advocates the autoplastic sutures in hernia, and before the last meeting of the American Medical Association at Atlantic City, he read his results after three years' work with this suture. He believes that he has demonstrated:

1. That it is an easy matter to split the tendinous aponeurosis of the external oblique from the external ring to the commencement of its muscle belly by simply lengthening the usual splitting of this structure.

2. From the cut edges of this, by carefully paralleling its fibres, that one can secure two strips of living tendon averaging four to five inches in length with which the structures to be apposed can be sutured.

3. That the use of such sutures can be adapted to any of the recognized procedures for the radical cure of hernia.

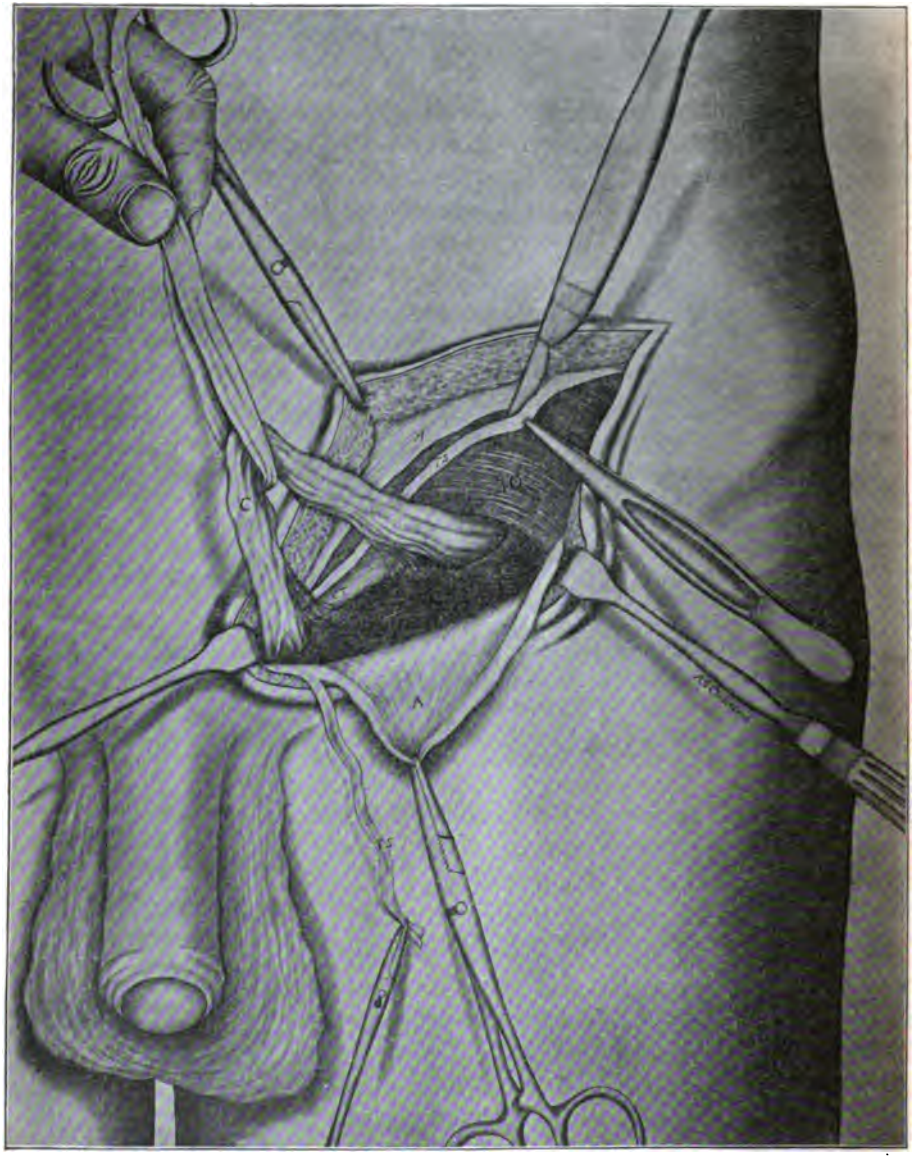
4. That, unlike any of the other numerous plastic operations advanced, the material lies directly in the wound itself instead of requiring extensive dissections or abnormal displacement of important structures.

He believes that this suture can be applied equally well with Bassini's, Macewen's, or Halsted's operation. Since his preliminary report of 12

[1] Journal of the American Medical Association, October 8, 1904, p. 1039.

cases treated by this method, he has now performed 93 consecutive operations on 85 cases, 82 males and 3 females, ranging in age between

FIG. 2.

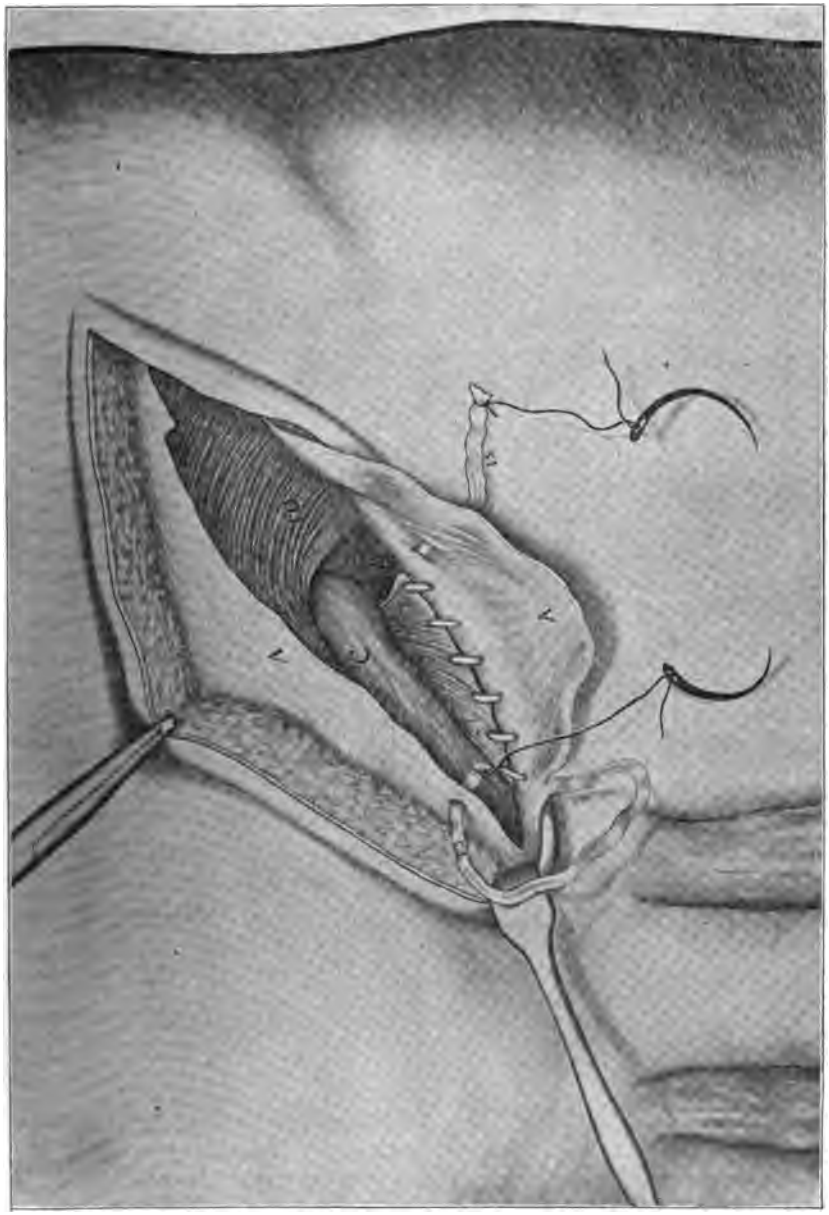


A., aponeurosis of external oblique; *I.O.*, internal oblique; *C.T.*, conjoined tendon; *T.S.*, tendon suture

six months and seventy-eight years. In 8 cases the hernia was double. Primary union was obtained in all except 2 cases (Figs. 2, 3, and 4).

The author's plea for the method is this: "It is logical that if the identical technique is followed, using these living strips as aseptic animal

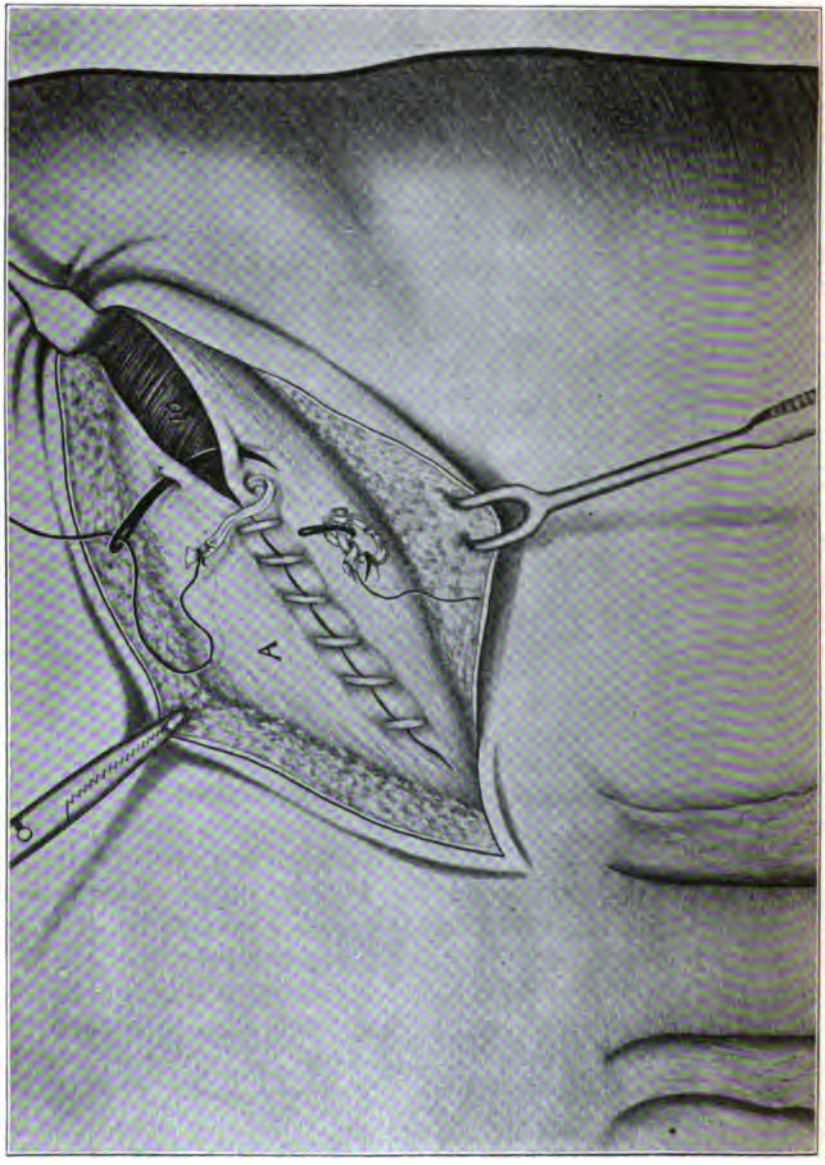
FIG. 3.



A., aponeurosis of external oblique; *I.O.*, internal oblique; *T.F.*, transversalis fascia; *C.*, cord; *C.T.*, conjoined tendon; *T.S.*, tendon suture

sutures are used, and a primary union results, that if they die and be absorbed they accomplish all that the foreign material does, while if

FIG. 4.



A., aponeurosis of external oblique; *I.O.*, internal oblique; *T.S.*, tendon suture.

they live (as experiment seems to prove) they remain to offer permanent resistance to future stretching."

Dr. McArthur's cases certainly prove that it is possible to effect a radical cure of hernia by means of an autoplastic suture. At the same time, anyone who has had a large experience in the radical cure of hernia must admit that the aponeurosis of the external oblique varies greatly in different subjects. In some cases with a large scrotal hernia the lower portion of the external oblique about the external ring is greatly thinned and offers very poor material for an autoplastic suture. The disadvantages of non-absorbable sutures in hernia, however, have been shown to be so great as to furnish strong reason for adopting McArthur's method, had we nothing else to fall back upon. As matters stand, however, we have abundant proof of our ability to perfectly sterilize ordinary absorbable sutures—*e. g.*, chromicized catgut or kangaroo tendon. We have, furthermore, sufficient evidence to show that such sutures remain unabsorbed sufficiently long to effect a radical cure of the hernia in nearly all cases. With such sutures the technique is simpler and the operation can be more quickly performed. Hence I believe they are more desirable.

Cure of Hernia in the Army. Banister, surgeon of the United States army at Manila, reports 100 cases of radical cure of hernia without mortality in the army, and with wound infection in but a single case. As far as these cases could be traced, there were only three slight relapses. Banister is a very strong advocate of Bassini's method of operation, and this method was used in all of his operations. He believes that every operable case of hernia between the ages of twenty to fifty years, without disease of vital organs, should be subjected to radical operation, as is the custom in the military service since September, 1895, when the War Department issued an order making radical operation for hernia the routine treatment in the United States army. Since this time several hundred operations have been performed by the officers of the medical department, with only one death, and with a rate of relapses which, he states, is so small as not to merit consideration.

Strangulated Hernia. Erdman,[1] in a paper upon this subject, reports 58 cases of strangulation in inguinal, femoral, and umbilical hernia. Twenty-six of the cases were inguinal hernia, with 5 deaths. In every one of these cases of inguinal hernia the cause of strangulation was found in the external abdominal ring, rather than in the neck of the sac.

This is a point which I have frequently alluded to in connection with strangulated hernia in children. It furnishes further evidence of the fact that strangulation of the neck of the sac, so frequently mentioned in text-books and surgical literature, is extremely rare.

[1] Journal of the American Medical Association, March 12, 1904, p. 47.

Erdman reports 19 cases of strangulated femoral hernia, 4 in males and 15 in females. Excision of the gut was found necessary in 3 cases; two of these excision cases recovered and one died. There was one other death in this series, making 16 recoveries in strangulated femoral hernia.

Erdman reports 6 cases of strangulated umbilical hernia with only 1 death, an extremely satisfactory result, as the mortality after operation in this condition has usually been recorded at from 50 to 80 per cent.

As regards the treatment of strangulated hernia Erdman believes that taxis should never be used for a moment after the diagnosis of irreducibility has been made. His case of femoral hernia reduced *en masse*, he believes, teaches a very powerful lesson as to the dangers of taxis.

Dr. George Tully Vaughan,[1] of Washington, D. C., presents an analysis of 25 cases of strangulated hernia treated by operation. They were observed in a series of 115 operations for inguinal and femoral hernia. Only 1 of his cases was complicated with undescended testicle; two were pro-peritoneal or interstitial herniæ. He reports 6 deaths, or a mortality of 24 per cent. In 6 cases resection of gangrenous intestine was performed, with 3 deaths, all due to general peritonitis, which existed at time of operation.

At the Johns Hopkins Hospital 64 operations for strangulated hernia were performed from 1889 to 1899, with 19 deaths, equal to 29.68 per cent.

Gibson in his collective statistics covering ten years, from 1888 to 1898, reports 226 resections of gangrenous intestine with immediate reunion, giving a mortality of 26 per cent., while in 26 cases in which the Murphy button was used the death rate was 22 per cent.

"**Clinical and Anatomical as well as Experimental Contributions to the Knowledge of Inguinal and Crural Bladder Hernia,**" is the title of an interesting paper by F. Karewski.[2] He states that while our knowledge of the subject has been much enriched during the last few years by numerous and exhaustive contributions to the literature, an essential point, namely, the diagnosis is still an unanswered question. It can rarely be made before operation, and even during operation we often fail to render it. According to Alessandri's compilation in 1901, covering 223 reported cases, the diagnosis, was made 18 times without being confirmed either by operation or post-mortem examination; 25 times a vesical hernia was found on autopsy, and in but 5 cases was the condition recognized before operation, in 147 during operation. In the latter series the bladder remained intact in only 11 instances. These data certainly show that a correct diagnosis of cystocele is very rarely made.

[1] Medical News, December 24, 1904.
[2] Arch. f. klin. Chir., vol. lxxv. No. 2, p. 395.

As regards the genesis of inguinal and crural cystocele we are, likewise, still in the dark. Since in more than one-half of the cases observed excessive development of prevesical fat was found, this hyperplasia of the fatty layers has often been looked upon as of etiological importance, although opinions differed as to the exact nature of the causative relation of this sign. Weakness and overdilatation of the bladder wall was also supposed to be an important predisposing factor in the formation of vesical hernia. However, as Lotheissen correctly points out, this condition does not seem to have very frequently existed, since it is rarely mentioned in the published reports of cases. Nor does the age of patients seem to have any influence upon the development of these herniæ, for one-half of the cases reported occurred in subjects below fifty years of age, even young children being not excluded. It is certain, however, Karewski states, that thus far no case of congenital bladder hernia has been observed, all being acquired.

It has, furthermore, been pointed out that the trouble is more frequent in men than in women. According to Alessandri only 22 per cent. of the cases reported occurred in women. To this Karewski replies, that if we remember that vesical hernia generally occurs in connection with inguinal hernia, which is much more common in men than in women, we need not wonder at the large proportion of bladder hernia in men.

Karewski reports 5 cases of bladder hernia. Of these 1 was clinically so well characterized that there can hardly be any doubt as to the diagnosis, although no operation was performed. In two instances the diagnosis was confirmed by the cystoscope; in 1 case the condition was recognized during operation, and once the bladder was accidentally injured, a fact which became manifest only later, during the period of wound healing. Three of his cases were crural hernia, which is not remarkable considering that four of his patients were women, in whom crural hernia is known to be more frequent than in men.

The view held by some that parts of the bladder very rarely bulge into the crural canal, Karewski does not believe justified. He calls attention to Krjnkow's recently published collection of 45 cases of cystocele in femoral hernia which, adding his own, makes 48 cases in a total of 250 cases so far published, or about 1 to 5, while the proportion of crural to inguinal hernia, according to Koenig, is only 1 to 9. In view of these figures the claim of a predilection on the part of the bladder to wander into the inguinal canal is not warranted.

Karewski has made extensive experiments upon the cadaver, which show that there is a close connection between the hernial openings and the bladder covering in persons of all ages without displacement of the bladder and lipoma and without any abnormalities of the organ; even

slight traction (high ligation without previous careful dissection of the peritoneum and prevesical fat) may cause a bulging of the bladder wall and the cutting of the ligature may easily give rise to a fistula. The larger the hernial opening the greater the danger of injuring the bladder.

There seems to be no doubt, Karewski states, that in cases with large hernial openings and in old ruptures, even in the absence of adhesive processes, a permanent lateral displacement may easily become established, and this, without a real cystocele, may render possible incarceration of the bladder by the ligature, thus giving rise to the later formation of a fistula.

Karewski, therefore, concludes that we must in all operations for hernia reckon with the possibility of injuring the bladder, but there is no justification for calling this occurrence a cystocele. One might better say that in a certain number of cases portions of the bladder wall must be looked upon as integral parts of the hernial covering, and that, therefore, the utmost care should be exercised to prevent injuring the same. In view of this possibility, he thinks that undoubtedly a large proportion of so-called vesical hernia really belongs into the category of accidental injuries to the bladder, and should be struck from the list of true bladder hernia.

Karewski considers the cystoscope the sovereign means of rendering a correct diagnosis in these cases. It alone enables us to recognize absolutely reliable signs, since it shows the relation of the displacement to the location of the hernia. On the other hand, he states that in spite of the importance of rendering the diagnosis of vesical hernia, it is not necessary in order to enable us to avoid injuring the bladder. This can be done if proper care is taken during operation.

Ovarian Hernia. A very rare variety of hernia, namely, ovarian hernia, is described at length by Heegard.[1] He states that the first collection of this variety of herniæ was made in 1813 by Deneux, and covered 14 cases: 9 inguinal, 1 crural, 1 vaginal, 1 ventral, and 2 ischiatic. The next series was collected by English in 1871 and covered 38, of which 27 were inguinal, 9 crural, 1 ischiatic, and 1 obturator. The latest compilation is that of Bitzako, published in 1892; it comprises 113 cases, 91 of which were inguinal, 17 crural. Most authors emphasize the great difficulty of diagnosing the condition.

Inguinal ovarian herniæ, in contradistinction to other forms of ovarian hernia, are usually divided into two groups: congenital and acquired hernia, the former preponderating. Of the 27 cases of inguinal ovarian hernia collected by English, 17 are designated as congenital. Puech, in a series of 88 cases, gives 54 congenital, 17 doubtful, and 17 acquired cases. Of the 91 cases reported by Bitzako 66 are stated to have been congenital.

[1] Arch. f. klin. Chir., vol. lxxv. No. 2, p. 425.

Heegard calls attention to the fact that the definition accepted for congenital hernia in general does not apply in cases of congenital ovarian hernia. In the latter the term "congenital" is supposed to mean that the prolapse of the ovary took place during fetal life, so that at birth the ovary had already descended into the inguinal canal or the labia major. The intrauterine origin of a hernial sac does not in these cases constitute the hernia a congenital one. He emphasizes the weak points of this distinction, calling attention to the difficulty of proving in the so-called congenital cases that the prolapse of the ovary actually took place before birth, and explains that this assumption of a fetal prolapse in this class of cases depends upon the belief of the normal presence of the canal of Nuck in the female fœtus, a supposition which he, the same as Duplay and Beurnier, denies. He bases his denial upon careful investigations made upon 7 female fœti, in none of which, he states, could the slightest sign of a peritoneal sac following the round ligament through the inguinal canal be detected. He, therefore, declares that those who build up theories as to the pathogenesis of the so-called congenital inguinal ovarian herniæ on the above assumption start from wrong premises. Personally, he believes that these herniæ, the same as all other varieties, develop after birth—*i. e.*, the prolapse of the ovary takes place after birth. He cites a case which he thinks absolutely proves the correctness of his assertion that the prolapse of the ovary is not caused by any influence of the ligamentum that corresponds to the supposed action of Hunter's gubernaculum upon the testicle, as is generally claimed.

Crural ovarian herniæ, as the above-mentioned statistics show, are far more rarely observed than inguinal ovarian herniæ. The explanation for this, Heegard states, lies in the fact that the ovary during a certain period of childhood assumes a position from where it can easily pass into the inguinal canal, provided a peritoneal sac is present in this canal. During this period the ovary is situated further away from the crural canal. Furthermore, the conditions for the development of a hernia—*i. e.*, the presence of a hernial sac, are more favorable in regard to the inguinal than the crural canal, at least in childhood; crural ovarian herniæ are, therefore, more common in later life.

Heegard states that thus far the ovary has been found to constitute the contents of the sac in 4 cases of ischiatic hernia.

As regards the function of the ovary when contained in a hernial sac, this remains unimpaired. The subjective symptoms vary greatly. In childhood, the time when the prolapse of the ovary most frequently occurs, there are hardly any symptoms, and so long as no pathological changes set in the little tumor often entirely escapes notice. It is usually not until puberty is reached that the ovary begins to cause trouble,

often becoming exquisitely sensitive to the touch. One of the diagnostic signs of the disease noticed in later life is the regular periodical enlargement of the organ. Furthermore, the shape of the tumor is most characteristic, at least in cases in which no pathological changes have taken place. It is well defined, more or less freely movable at its upper pole. Two parts may be distinguished, namely, an egg-shaped tumor below and a round, cord-like prolongation of the same above, the latter extending through the open inguinal canal into the abdomen. The open inguinal canal and elongation of the tumor into the abdomen prove that we have to deal with a hernia.

As regards the treatment our foremost aim must, of course, be the preservation of the ovary whenever possible. In the few cases in which the ovary is reducible, taxis may be employed, provided no pathological changes are discernible. A truss should then be worn. In all other cases herniotomy should be done as soon as the nature of the trouble has been determined, and here the utmost care must be taken to determine the condition of the ovary; if healthy it should be reduced through the widened hernial opening, the hernial sac being ligated and the canal closed. If the organ is found cystic or otherwise degenerated it will have to be amputated, after careful ligation of the pedicle, above the torsion.

Radical Cure of Crural Hernia. Carl Goebel[1] brings a comparative review of all the various methods in vogue for the radical cure of crural hernia and also describes a new procedure of von Mikulicz's, adding the report of a case of large crural hernia successfully operated upon by the new method. The principal feature of the same is that of employing the periosteum of the os pubis for the formation of a double flap. The technique is briefly as follows: isolation, ligation, and submerging of the hernial sac; incision down to the bone, from the tuberosity of the pubis to the vessels, in a frontal direction, and slightly anterior to the crest of the pubis. Formation of an upper and lower periosteal (periosteal-muscle-fascia) flap out of the os pubis, if necessary, with sagittal section across the bone at the outer and inner end of the frontal incision. Suture of the upper (inner) periosteal flap to the outer border of the ligament; subcutaneous suture of the remaining fascia; suture of skin.

The advantage of this method, it is believed, is that the turned-up periosteum, joined to Poupart's ligament, causes an ideal closure of the crural canal at its entrance at the very beginning of the femoral infundibulum. The results from the simpler method of purse-string sutures have been so nearly ideal that there is seldom need of resorting to the difficult and complicated methods above described.

[1] Beiträge z klin. Chirurgie, 1904.

SURGERY OF THE ABDOMEN, EXCLUSIVE OF HERNIA.

By EDWARD MILTON FOOTE, M.D.

THE STOMACH.

Operations upon the stomach have been performed on account of traumatic perforations, ulcers, and their sequelæ, and cancer. These three great groups will always include most of the cases of gastric surgery; but there are some other conditions, less common, for which the aid of the surgeon may be invoked. Five such conditions will be briefly mentioned—viz., congenital stenosis of the pylorus, congenital hour-glass stomach, non-perforating traumatism, cirrhosis, and volvulus.

Congenital Stenosis of the Pylorus. Many surgeons scoff at the diagnosis of a congenital stenosis of the pylorus, but each year there are more reports of cases, and as attention is more generally directed to this condition it is likely to prove more common than was previously supposed. As the two chief symptoms—vomiting and constipation—are common in infants, one should, if possible, recognize the other symptoms early, before the strength of the child is too far gone to permit of successful operation. These symptoms are increased peristalsis and dilatation of the stomach and the presence of a palpable, thickened pylorus.

A patient seen by Cleveland[1] was a male child, healthy at birth but troubled with vomiting from the fourteenth day, and with constipation so marked that the bowels moved only about once a week. There was great emaciation. At two months of age there was well-marked peristalsis in the epigastrium from the left to the right, and a succussion splash could be elicited. No thickened pylorus could be felt. The diagnosis was made, but operation was refused. The child lived a month in this condition, developing one new symptom—repeated convulsions—thought from the mother's description to be due to tetany. After death the pylorus was found to be hard, three-quarters of an inch in length, and shaped like a bobbin with a constriction in the middle. The maximum circumference at either end was one and seven-eighths inches. The lumen admitted an instrument with a circumference of five-eighths inch. The mucous membrane in the pylorus lay in folds.

[1] British Medical Journal, 1904, i. p. 1073.

McCaw and Campbell report a similar case in which operation was performed upon a male child somewhat more than two months old. The stomach was hypertrophied and dilated, and the pylorus, not palpable before operation, was found to be the "size of a walnut." It was incised longitudinally and sutured transversely, Halsted and Lembert sutures being employed. The vomiting continued, and in six days the child died. The suture line was in perfect condition, the pylorus readily admitted a lead-pencil, but when the stomach was distended with water *not a drop passed the pylorus*, which was obstructed by the redundancy of the mucous membrane, which fell in folds about the pyloric orifice.

Cautley[1] gives as the symptoms of congenital pyloric stenosis progressive wasting, vomiting unaccompanied by nausea and characteristic of pyloric obstruction, absence of bile from the vomit, constipation, clean tongue, sweet breath, a dilated stomach, visible peristalsis, and a palpable pylorus. This he has felt in the last 5 cases that he has seen. Four of these patients were operated upon with success. Cautley warns against the inference sometimes made after death as to the patency of the pylorus. This may be so firmly contracted by rigor mortis that no fluid can be squeezed through it, when fluid was passing in larger or smaller amounts up to the point of death.

Late Effects of Congenital Pyloric Stenosis. Maylard[2] says that gastric trouble in the adult is often a sequence of congenital narrowness of the pylorus. In support of this view he cites 7 cases in which the pyloric stenosis was verified by operation. All of these patients suffered from indigestion, gastric catarrh, and either occasional or permanent dilatation. The operation in each case was a gastrojejunostomy, and it was followed by a complete cure of the symptoms in 4 cases and marked improvement in the others. It is to be noted that the ease with which food passes the pylorus is dependent not only on the size of the canal but the rigidity of the sphincter. The article is illustrated by two diagrams (Figs. 5 and 6).

Hour-glass Stomach. Is an hour-glass stomach ever congenital? Brook[3] says that it is, mentioning a case within his own practice. A woman, aged fifty years, had suffered for years with indigestion relieved by vomiting. This symptom progressed until emaciation was extreme and operation was performed. The stomach was almost equally divided into two pouches by a narrow constriction. Gastroplasty was performed. The stomach, both outside and inside, appeared perfectly normal, and its wall at the site of constriction was as flexible and thin

[1] Lancet, 1904, i. p. 645. [2] British Medical Journal, 1904, i. p. 416.
[3] British Medical Journal, 1904, i. p. 1073.

as at other points. Nor was there any sign of present or previous ulcer. No autopsy was obtained.

Effect of Non-perforating Traumatism. Monprofit[1] believes that not enough attention is given to traumatism as the cause of gastric disorders. He relates the case of a man who received a violent blow in the stomach and suffered for months afterward with repeated vomiting and other symptoms of gastric intolerance. He was greatly emaciated and presented a tumor of the epigastrium. Laparatomy was performed. There was a mass of inflammatory deposit around the pylorus and the remains of hemorrhage in the omentum, but no cancer. A posterior gastroenterostomy produced a complete cure.

FIG. 5.

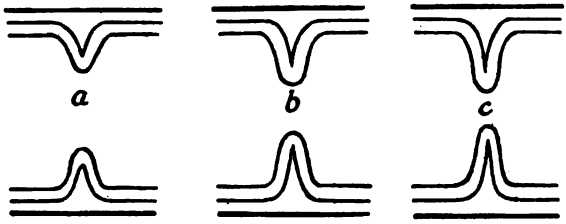


FIG. 6.

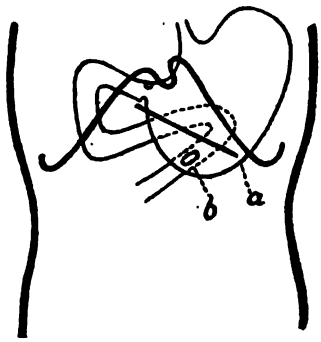


FIG. 5.—Diagrammatic longitudinal section of pylorus (natural size): *a*, normal diameter of pyloric orifice, 12 mm. to 15 mm.; *b*, *c*, abnormal diameters, 7 mm. and 3 mm.

FIG. 6.—Position of the parts after performance of a posterior gastrojejunostomy: *a*, skin incision; *b*, orifice of bimucous fistula, with union of gut above to under surface of stomach.

Gastric Cirrhosis. Sheldon[2] believes that there is such a condition as cirrhosis of the stomach marked by contraction of the organ, thickening of its walls, chronicity, vomiting, though not of blood; absence of a tumor on palpation, absence of glandular or hepatic involvement, and relief of the stomach symptoms when rectal feeding is resorted to. He cites from medical literature 10 cases described under various names, which he believes should properly be called cirrhosis of the stomach, and adds an eleventh from his own practice. The etiology of the disease is unknown. Only one of these patients was alcoholic. The treatment recommended is a gastroenterostomy, which was performed by Sheldon with complete success. If the stomach is not relieved surgically

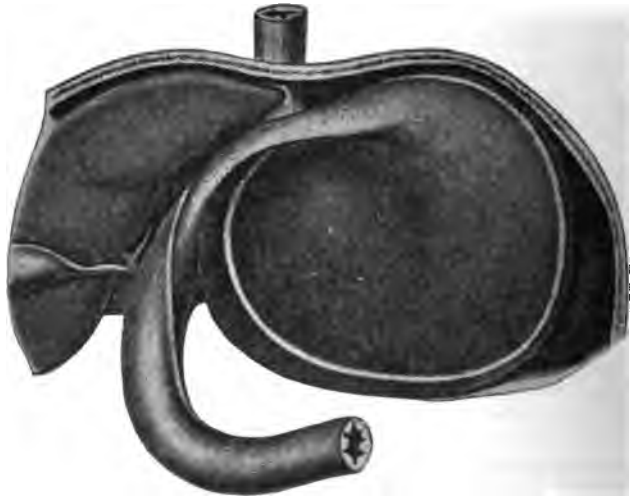
[1] Revue de Chirurgie, 1904, vol. xxx. p. 637.
[2] Annals of Surgery, 1904, vol. xxxix. p. 341.

the fibrous induration progresses until the patient dies of inanition, with or without pyloric stenosis.

Volvulus of the Stomach. Borchardt[1] reports a case of volvulus of the stomach occurring in a man, aged forty-four years, with a dilated stomach. Operation was performed, but the true nature of the difficulty was not recognized and the twist was not relieved. Fig. 7, made from a cast of the stomach after death, shows the manner of the volvulus. The omentum has been removed.

Borchardt gives the histories of 4 other cases of volvulus of the stomach previously reported. In all of these the colon was drawn upward nearly

FIG. 7.



Volvulus of the stomach (BORCHARDT.)

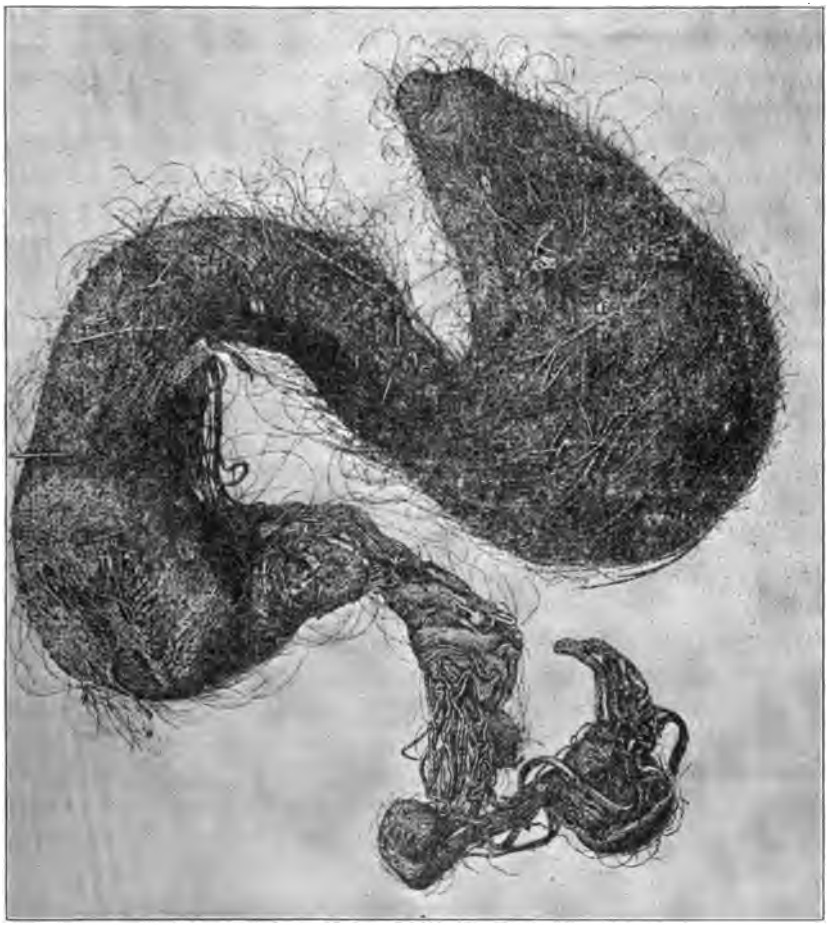
to the diaphragm, although in his case the colon was not disturbed. He says the diagnosis can be made in either type of volvulus, as soon as the abdomen is opened, by the fact that the congested stomach is covered with a thin membrane. This membrane is the large omentum in the infracolic type of volvulus, and the gastrocolic ligament in the supracolic type of volvulus. As stated, Borchardt lost his patient. In 3 of the other cases the nature of the lesion was recognized, and the stomach untwisted with the recovery of the patient.

Foreign Bodies. Hair-casts of the stomach of animals and children have been sometimes reported,[2] but a cast of the stomach and duodenum is a novelty. Such a one, shown in Fig. 8, was successfully removed by

[1] Archiv klin. Chirurgie, 1904, vol. lxxiv. p. 243.
[2] PROGRESSIVE MEDICINE, June, 1902, p. 73

Ranzi.[1] The patient, a girl aged twenty years, gave the usual symptoms of loss of flesh, vomiting, constipation, and indefinite gastric tumor. Four years previous she suffered an acute attack of intestinal obstruction, relieved by the passage of a good-sized hair-ball, which had apparently broken off from the larger mass in the stomach.

FIG. 8.



Cast of stomach and two-thirds of duodenum made up of human hair, threads, and elastic bands. (RANZI.)

Gastric Ulcer. The decision to submit a patient with an uncomplicated gastric ulcer to surgical treatment must ultimately rest on the results obtained by surgical treatment as compared with those obtained by medical measures. Here are the opinions of a physician and a sur-

[1] Wiener klin. Wochenschrift, 1904, vol. xvii. p. 1342.

geon, respectively, who have looked up the late results of treatment:

A PHYSICIAN'S OPINION. Russell[1] has succeeded in tracing the after-histories of 47 patients who were treated in the Birmingham General Hospital for gastric ulcer by medical means only. He found that no less than 45 per cent. were suffering with stomach symptoms of more or less severity at the time of report, one-third of them getting repeated and definite attacks with intervals of immunity, and two-thirds suffering from almost continual pain. There were besides a further 6 per cent. of the total number of patients discharged, of whom it could not yet be said whether they should or should not be added to the 45 per cent. of permanent sufferers. These figures, Russell says, afford some justification for the plea often made in favor of a more frequent resort to operative interference in persistent cases of gastric ulcer, always providing that the mortality of the operation can be kept at a really low figure, and that the results in cases operated upon can be shown to be permanently good. Further evidence on both of these points seems to him to be needed.

A SURGEON'S OPINION. Moullin[2] gives an account of the after-life of patients operated on by him for gastric troubles, exclusive of perforation and carcinoma. He was able to trace 18 patients. Gastrotomy was performed upon 2 patients for vomiting, with pain or hemorrhage, but nothing abnormal was found. Their subsequent condition was about the same as before operation. In 8 patients gastrotomy revealed one or more ulcers which were treated by ligation (one excision and suture). One was improved only temporarily. All the others were permanently improved or entirely cured of the pain, vomiting, and hemorrhage. Two other patients suffering from ulcer were cured by gastroenterostomy. Two patients with pyloric stricture were cured by pyloroplasty, and one with perigastric adhesions was improved by this operation. Two with pyloric stricture were treated by gastroenterostomy; one was improved and the other cured. One patient was cured by drainage of a perigastric abscess.

Thus it will be seen that the results of operation for gross abnormalities were quite satisfactory. The number of cases is too small to show whether ligation or excision or gastroenterostomy is the best method of treatment for chronic ulcer. Undoubtedly the rest in bed and more careful diet are material factors in the improvement, whatever operation be selected.

EXCISION OF THE ULCER OR GASTROENTEROSTOMY. Maunsell[3] thus puts the case against excision of non-perforating ulcers of the stomach:

[1] Lancet, 1904, vol. i. p. 288. [2] British Medical Journal, 1904, i. p. 419.
[3] Dublin Journal of the Medical Sciences, 1904, vol. cxvii. p. 1.

1. It is not easy to locate the position of an ulcer at operation.

2. Ulcers are most commonly situated on the posterior wall and are hard to reach, more especially if the base is adherent to the pancreas, etc.

3. Ulcers are frequently multiple.

4. Ulcers are very frequent in the pyloric antrum and at the pylorus, where excision would lead to narrowing unless combined with pyloroplasty, which is not always advisable or readily performed.

5. The cause of the ulceration is in no way mitigated by the procedure, and the trouble may recur at a future date.

Gastroenterostomy is the safest and most satisfactory operation—all things considered.

Riedel[1] has published a critical review of 58 cases of ulcers of the stomach situated in its middle section—viz., in the lesser curvature, the anterior and posterior walls. The article is far too extensive for an abstract, so that we must content ourselves with the author's conclusions:

1. Ulcers in the middle section of the stomach are oftener multiple than single.

2. Those which begin in the lesser curvature usually extend in the form of a horseshoe to the anterior and posterior walls.

3. These ulcers are usually of a destructive character. They destroy the walls of the stomach not only in their depth, but also extend laterally and longitudinally, so that the cardia and pylorus are drawn much nearer together.

4. Stenoses of high degree are only seen when the greater curvature is involved in the ulceration.

5. As long as the ulcers are small and do not cause much formation of fibrous tissue they remain in the median line. The point of pain is then between the umbilicus and ensiform. Not all ulcers give rise to pain.

6. If the serosa in the neighborhood of the ulcer is much thickened, of if the ulcer has set up adhesions posteriorly with the pancreas or anteriorly with the left lobe of the liver, a large tumor may be felt.

7. Such a tumor mass moves almost invariably to the left as it has no place to rest on the front of the spinal column. There is gastric pain on the left side.

8. This left-sided pain is often sufficient for a probable diagnosis of gastric ulcer, even though no tumor can be felt, provided that there are present the usual symptoms of gastric disease, eructations, vomiting, etc.

9. Ulcers in the middle section of the stomach produce hæmatemesis in the minority of cases. Oftener they give rise to vomiting.

[1] Archiv klin. Chirurgie, 1904, vol. lxxiv. p. 773.

10. The treatment in these cases should be at first dietetic and medicinal. An operation is to be regarded as a last resort.

11. Whenever possible operation should be performed before the ulcer has eaten its way into the pancreas or the left lobe of the liver.

12. The fewer the adhesions about the ulcer the easier is its wedge-shaped excision and the closure of the wound by suture; but this operation is only practicable when the loss of the gastric wall is small.

13. If the defect in the middle section of the gastric wall is greater, or if the ulcer has perforated into the pancreas or liver, transverse resection of the stomach is indicated.

14. The union of the cardiac and pyloric portions by Billroth's method is likely to succeed if the whole suture is through healthy gastric wall.

15. If the gap is very great it will be close the pyloric incision by itself, and to unite the cardiac portion and the jejunum by a posterior anastomosis.

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16. This procedure is absolutely necessary when the ulcer has involved the pylorus. The duodenum must then be closed.

17. Union of the cardiac and pyloric portions by suture without resection of the ulcer is an uncertain procedure.

18. Simple gastroenterostomy is also unreliable since the cardiac portion of the stomach is displaced to the left, so that the loop of jejunum which is used for anastomosis may be forcibly pulled upon.

19. If perforation of an ulcer results in subphrenic abscess, the left pleural cavity should be opened widely and the abscess drained through the diaphragm.

20. The operative results which Riedel has hitherto obtained in this class of cases are unsatisfactory. Better results may be obtained by an early diagnosis and a relatively early operation, for the stomach is an organ which offers favorable conditions for successful suture.

Stevens[1] reports an operation upon a patient who had suffered from pyloric stenosis and gastric dilatation for twenty-one years. The pylorus was a hard, gristly mass, but gave no evidence of malignant disease, nor were there any adhesions to the gall-bladder or any other viscus. A posterior gastroenterostomy was performed. This relieved the patient of his symptoms, and at the time of report he was enjoying his food and gaining weight.

PERFORATING GASTRIC ULCER. Operation for perforating gastric ulcer has become so common that the report of individual cases ordinarily excites no comment, but when 9 consecutive cases with 8 recoveries are presented from a single hospital, it is worth while to inquire regarding the treatment. The patients were treated by Turner and English[2] in St. George's Hospital, London.

[1] Lancet, 1904, i. p. 935.

[2] Lancet, 1904, vol. ii p. 145.

All of Turner's 7 cases, with the exception of a leaking subphrenic abscess (Case VII.) were treated in the same way. The ulcers when found were first of all sutured as rapidly as possible without paying undue attention to the non-inclusion of the mucous membrane or carrying the suture for any distance beyond the limits of the perforation. In nearly all the suture was subsequently strengthened by a few Lembert stitches. Each case, except the one referred to above, was treated by free irrigation, warm sterilized water or weak boric lotion being used, *after* provision had been made for drainage, not only at the seat of the wound but in the suprapubic region and the flanks, and this irrigation was continued until the outflowing fluid was absolutely clear. The peritoneal cavity has been irrigated in this way by as much as fourteen or sixteen pints. Irrigation was designedly omitted in Case VII. (leaking subphrenic abscess); the contaminated parts, however, were cleaned by simple sponging. Irrigation, where there is any localized collection of foul septic pus, on account of the danger of dissemination is not to be recommended.

Drainage-tubes as large as the middle finger (usually three in number) were inserted; (1) above the pubes, (2) down to the seat of the ulcer, and (3) in one or both kidney pouches. In the case where the appendix was the seat of a fecal concretion and was removed, a drainage-tube was passed through the right linea semilunaris. In nearly all the cases the suprapubic drainage disclosed a pelvic collection of peritoneal fluid and stomach contents.

Only one of the perforations was not sutured; that one was on the posterior surface of the stomach close to the œsophageal end, in the immediate neighborhood of the aorta; the anatomy of the surrounding parts was much obscured by adhesions and inflammatory changes, and it was deemed safer to treat the case by gauze packing.

It is not claimed that the subsequent drainage had much to do with the success of these cases, but the incisions made for this purpose undoubtedly allow at the time of the operation a complete and thorough searching out of any little peritoneal pouch or pocket that might otherwise escape irrigation and thus largely contribute to the eventual recovery of the patients. The one patient who died had come a long way from the country and was practically moribund at the time of the operation. All the 8 cases in which there was any chance of recovery got well.

English's cases (VIII. and IX.) were treated in the same way with the trifling exception that an omental graft was used to help to close the perforation.

These surgeons were fortunate in seeing their patients early. Four of the operations were performed in twelve hours or less after perforation, three others in less than twenty-four hours. In the remaining two

the interval between perforation and operation was two days. One of these patients died. The one who recovered was a very anæmic girl with an admission temperature of 103° and pulse of 140. The abdomen was very tender all over, especially in the left hypochondrium. It was slightly rigid but not much distended; there was fair movement on respiration; splashing sounds were heard. Tubular breathing and dulness were present over the lower part of the left lung.

A median epigastric incision was made. There were much straw-colored fluid and free gas in the peritoneal cavity. A small perforation was found near the œsophageal end of the stomach on the posterior surface close to the aorta; there were many adhesions around it. Gauze packing was passed to the perforation. A second opening was made in the hypogastrium; much foul fluid was sponged out, with general irrigation with weak boric lotion. Drainage-tubes were passed into the pelvis and into each flank. There was much bronchitis during the week after operation; thrombosis occurred in the left calf during the third week. The patient was discharged from the hospital on the thirty-second day.

A recovery after operation performed as late as this is the more remarkable in that adhesions do not seem to have limited the escaped fluid to a small part of the peritoneal cavity.

Wood[1] operated fifty-two hours after the occurrence of perforation in the stomach of a man aged twenty-five years, and succeeded in saving his patient. This is unusual after so long an interval when the perforation is into the free peritoneal cavity. During this interval there was more or less pain, gradually increasing intestinal stasis, and accompanying distention, but only a little fever and rise of pulse. At the operation the pulse was 96 and the temperature 101°. The perforation was minute, near the pylorus, and the parts were so bound down by adhesions that suture was almost impossible. It was therefore abandoned and a cyanide gauze wick was introduced leading to the perforation. Through a right lumbar incision and a suprapubic incision the purulent fluid in the general abdomen and pelvis was washed away.

Blake[2] says that the most important advance in the treatment in perforated gastric ulcer has been the establishment of the fact that early operation is absolutely necessary for the attainment of good results. To wait for the shock to disappear is simply to invite failure. The shock of a perforation is caused by irritation of the peritoneum, and disappears with the administration of the anæsthetic. He reports six patients operated upon, with three deaths. No patient died who came to opera-

[1] Lancet, 1904, ii. p. 1563.

[2] American Journal of the Medical Sciences, 1904, vol. cxxviii. p. 985.

tion within twenty hours of the perforation. Blake's method of treatment is given on another page under the title "General Peritonitis."

Maunsell[1] states that "The perforation should be closed by a double row of continuous sutures and the peritoneum should be cleansed with gauze swabs and plenty of warm, normal saline solution. The chief error is made in striving to do without free flushing and in resting satisfied with mopping up the small amount of fluid seen immediately in the operation area without making a rapid but systematic search through the whole cavity. I venture to state that there are very few cases of perforation in which the pelvis is not full of fluid, and in which a hand passed above and behind the spleen on the left and above and behind the liver on the right will not bring from these treacherous pockets sufficient morbid material to reward the operator for his search." Maunsell advises against evisceration for purposes of cleansing, but recommends incision and deflation of the much-distended stomach and intestines. Gastroenterostomy is recommended if the ulcer is situated near the pylorus, or if the pylorus is constricted.

White[2] is an advocate of excision and suture in cases of perforated gastric ulcer. He reports 5 cases with 3 recoveries, and remarks: "The fact that 2 of the 5 cases died long (two weeks and six weeks) after recovery from the immediate effects of the perforation is disappointing, and is evidence of how formidable the sequelæ to the condition may be. In both cases the fatal result was the outcome of ulceration of the mucous membrane along the line of suture. . . . Where the ulcer is easily accessible its excision, together with the surrounding indurated and thickened tissue, secures a far better closure of the perforation than merely bringing together the peritoneal surfaces, and with the use of the continuous suture takes up very little additional time."

It is difficult to understand how a man can write the three sentences above quoted without observing their inconsistency. He lost two patients from a suture in diseased tissue—one dying from infection and the other from secondary hemorrhage—and yet recommends a method of operation the success of which necessarily depend upon the power of healing of the gastric wall in the close vicinity of a spontaneous necrosis of that wall. Were excision necessary this risk could not be avoided, but scores of recorded cures by suture alone show that the more heroic excision formerly advocated by many surgeons is in most cases unjustifiable.

Perforated Ulcer or Appendicitis? A perforated gastric or duodenal ulcer has more than once been mistaken for appendicitis.

[1] Dublin Journal of the Medical Sciences, 1904, vol cxvii. p. 1.
[2] British Medical Journal, 1904, i. 421.

The symptoms are often so similar that no one need be ashamed of this error; but once the abdomen has been opened and the signs of perforative peritonitis discovered, the surgeon should not be turned from the true source of the infection by the discovery of a more or less inflamed appendix *which has not perforated.* It is even a serious question whether he should prolong the operation by the removal of such an appendix. The following four histories are well worth perusal:

A boy aged thirteen years complained of abdominal pain and was put to bed with a hot-water bottle applied to the abdomen. In the morning he felt better but his stomach was still sore. He ate a good dinner, and an hour later was seized with violent abdominal pain, followed by collapse and rigid abdomen. About nine hours after the attack the abdomen was opened by Cheyne[1] in the appendical region. On exposing the peritoneum it at once bulged out in the wound and on puncturing it gas whistled out. On enlarging the opening the small intestines were forced out, partly by the gas and partly as the result of the great rigidity of the abdominal walls, which had not become relaxed under the anæsthetic. Some thin, whitish fluid also came out of the abdomen. For the most part the intestines were normal in appearance, but on some of the coils of the small intestine, which came apparently from the left side of the abdomen, there were some flakes of lymph. The pelvis and lower part of the abdomen were well irrigated with salt solution till the fluid returned clear, and the intestines were then, gradually but with considerable difficulty, returned to the abdominal cavity. The cæcum and appendix were next pulled out. The appendix was long, thickened, a good deal reddened, and contained a large concretion; but there was no perforation of the appendix nor of the cæcum in the neighborhood. The appendix was removed in the usual manner.

As it was evident that there must be some graver lesion than the condition of the appendix to account for the state of matters, and as practically the whole of the small intestine had been seen, and as also there was no fecal material present in the abdominal cavity, a second incision was made over the stomach. An opening was found near the cardiac end from which gas and gastric contents were escaping. It was sutured. The abdomen was irrigated and drained. The patient recovered.

A girl aged seventeen years complained for four days of indefinite epigastric pain, followed by sudden intense pain, worse in the lower abdomen and right side, with vomiting and collapse. Low[2] made a diagnosis of peritonitis probably from the appendix.

The abdomen was opened by an incision over the appendix, giving

[1] Lancet, 1904, i. p. 1641.

[2] Ibid., i. p. 1789.

exit to a quantity of non-odorous purulent fluid containing flakes of lymph. The coils of small intestine were seen to be intensely congested and lightly glued together by sticky lymph. The appendix was found to be four inches in length, rigid with thickened walls, while its lumen contained two concretions. Its peritoneal coat was intensely injected in common with the rest of the peritoneum. It was removed in the usual manner, but though obviously in a condition of acute inflammation there was no perforation or area of necrosis and it was not therefore considered to be the cause of the general peritoneal infection present. The two ovaries and tubes were examined and found to be intensely congested as part of the general peritonitis of which, however, they did not appear to be the origin.

A median incision was then made above the umbilicus and it was at once seen that the peritonitis above the line of the transverse colon was of older date, judging by the amount of lymph and adhesions, than the inflammation in the lower part of the sac. After some difficulty a perforation was found in the middle of an indurated area the size of a five-shilling piece, situated beneath the left lobe of the liver on the anterior aspect of the small curvature of the stomach and close to the cardiac end. This was invaginated and the edges were brought together by two layers of fine silk sutures. The abdomen was then carefully flushed out with hot saline solution and sponged nearly dry and drained. The patient recovered.

The third case is somewhat different. The appendix was not seen but the presence of a localized abscess in its vicinity seemed to warrant the diagnosis of appendicitis. The subsequent history of the case proved the mistake in diagnosis, and the gastric perforation was finally recognized but not soon enough to save the patient. The operator was Milward.[1]

The patient was a female, aged seven years. She had been ill at home for fourteen days. On admission there were tenderness and slight bulging in the right iliac fossa, and general distention of the abdomen. An incision was made over the appendix and two ounces of pus were evacuated. The abscess cavity was outside the cæcum and was densely walled round by adhesions, the abdominal cavity being apparently quite shut off. The appendix was not found. From this time until she died, thirty days later, the wound showed not the slightest tendency to heal. The bowels were confined for the first five days, then she had diarrhœa for three days, and afterward intermittent diarrhœa and constipation. Eight days after admission a slight swelling, which was tympanitic on percussion, appeared in the epigastrium. This very

[1] Lancet, 1904, ii. p. 761.

slowly increased in size but varied considerably with the state of the bowels, being more tympanitic and larger during constipation. It was thought to be the distended colon. On the twenty-fifth day the swelling so increased that the epigastrium was incised, opening a cavity over the stomach, containing gas and very little pus and lymph. This cavity was also densely shut off from the general peritoneal cavity by adhesion of the periphery of the stomach to the anterior abdominal wall. On the following day gastric contents were found in the cavity as well as a perforation of the anterior wall of the stomach of the size of a three-penny piece. An attempt was made to suture the perforation but was hardly successful owing to the adhesions preventing the margins coming together.

In the fourth case the diagnosis was still more difficult, since the ulcer, which was of the duodenum, had not perforated, and there was consequently no peritonitis. The patient, a man aged fifty-six years, had suffered from at least two attacks of pain in the region of the appendix, so that an operation was decided upon by Lediard.[1] There was also a small umbilical hernia.

On opening the peritoneal cavity the omentum was found to be adherent to the umbilical ring. This was freed without much difficulty. The appendix was found lying behind the cæcum and was sharply "kinked." It presented no signs of acute inflammation but was broader in diameter than normal and its surface showed old lymphoid deposit. It was removed, and after careful treatment and ligation of the stump the great omentum was pulled down over the intestines and the abdominal incision was closed. A mural abscess developed, but healed promptly after drainage.

On the fifth day after operation compound licorice powders were given to open the bowels. Two tarry stools were passed containing blood. On the eighth day after operation the stools again contained much tarry-looking blood, and on the eighteenth day the blood was still more copious in amount. Up to this time the patient looked and felt fairly well, his temperature was fairly regular, and his pulse never above 80. On the nineteenth day his pulse became a little intermittent and the fact of his having lost a large quantity of blood now began to be obvious in the pallor of his skin and the pearliness of his mucous membranes. Opium was exhibited for eight days, during which time his bowels were confined. The source of the hemorrhage was much debated; it was obvious from the extreme alteration of the blood that its source was high up in the intestinal tract, and hepatic cirrhosis, gastric ulcer, and carcinoma were considered, but all were dismissed for want of evidence.

[1] Lancet, 1904, ii. p. 761

On the twenty-eighth day an enema brought away melænal stools. An enema on the thirty-first brought away lighter-colored stools, and enemata on June 2d, 4th, 6th, and 7th produced normal colored stools. About this date it was suggested that the hemorrhage was due to a duodenal ulcer consequent on the breaking down of the skin incision, the process being akin to that following burns. Whatever the cause, a little hæmatemesis on the 14th was again followed by melænal stools on the 15th, 16th, and 17th, and the patient succumbed on the 20th from exhaustion, despite every variety of medicinal styptic treatment.

At autopsy there was found an ulcer of the second portion of the duodenum, in the base of which there was an eroded pancreatic artery. A section through the margin of the ulcer with the attached pancreas showed that the floor of the ulcer was formed by the thickened capsule of the pancreas, the walls of the intestine being completely destroyed.

Hemorrhage from a Duodenal Ulcer. An experience by Allingham[1] shows the benefit to be derived from a *gastroenterostomy* under such circumstances. The patient was a man, aged forty-two years, who suffered for some years with hæmatemesis and tarry stools. There was gastric dilatation. Pain was never a prominent symptom. One evening while lying quietly in bed he was seized with an attack of severe pain, extending from the hepatic region to the right groin and testicle A diagnosis of perforation of a gastric or duodenal ulcer was made, and operation performed in a few hours. The peritoneal cavity was full of escaped intestinal contents. The perforation was two inches below the pylorus. It was sutured and the peritoneal cavity flushed and wiped, and the abdomen refilled with sterilized water in the hope of diluting any residue of intestinal discharge. The patient did well and liquid feeding by mouth was begun on the fourth day and increased very cautiously. Two weeks after operation, and again at four weeks, there was vomiting of blood and blood in the stools. This last attack was so severe that life was despaired of, but the patient again rallied. One week later, when his strength permitted, gastroenterostomy was performed. The duodenum at the site of the ulcer was quite shut off by adhesions, and could not be seen. The patient recovered completely without further hemorrhage.

Gastric Cancer. Symptoms of Gastric Cancer. Perry and Shaw[2] have published a very full report of 306 fatal cases of carcinoma of the stomach treated in Guy's Hospital from 1826 to 1900 which contains much that is interesting to the surgeon. The proportion of males to females was about 5 to 2. The youngest male was fifteen years, the

[1] Lancet, 1904, ii. p. 888.
[2] Guy's Hospital Report, 1904, vol. lviii. p. 121.

youngest female eighteen years, and the oldest of the two sexes seventy-one years and eighty-one years of age. The average duration of the illness according to the histories taken was about nine months, from the onset of symptoms until death.

In 13 cases the extension of the growth and ulceration produced perforation of the wall of the stomach and acute peritonitis. There were 7 other cases of perforation in which only a localized abscess was caused. Perforation is not likely to occur early in the disease. The average duration of life from the beginning of the disease in these 20 cases was over eleven months. The histories of these patients show that perforation was generally not accompanied by any marked symptoms. In only 6 of them was there any symptom which might have aroused suspicion of perforation, and it does not appear that in a single instance the diagnosis was made during life. This is in striking contrast to the violent symptoms which usually follow perforation of gastric ulcer. It simply means that in gastric carcinoma the perforation takes place at a time when the patient is already moribund and the peritoneum is incapable of resenting the presence of foreign material.

TREATMENT OF GASTRIC CANCER. Nordmann[1] contributes an article based on the clinical histories of 126 patients treated in Körte's clinic for tumors of the stomach. Most of these tumors were carcinomata, but 2 of the 38 which were resected were found to be other than carcinoma—viz., 1 sarcoma and 1 due to tuberculosis. These last two tumors were both of the pylorus and were both palpable before operation.

While this article does not contain much that is new, there are points in it worth notice. In only about one-fourth of the cases was the patient's condition such as to render removal of the tumor feasible. This is a sad commentary on our diagnosis of gastric diseases. In more than one-half of the cases gastroenterostomy was performed. This was the palliative operation of choice. In a few instances a fistula was established leading to the stomach or jejunum, and in some others nothing more than an exploration was attempted.

All of the patients when first seen were distinctly cachectic. Some of them dated their illness years back, others said they had symptoms for only a few weeks. Nordmann explains this by saying that cancer of the stomach does not give the patient severe symptoms until it produces stenosis of the pylorus. Vomiting, loss of flesh, and constipation, were the symptoms complained of in almost every instance.

Only 11 of the 38 patients upon whom resection of the tumor was performed had complained of pain in the stomach. This pain was

[1] Archiv klin. Chirurgie, 1904, vol. lxxiii. pp. 536, 873

sometimes distinctly of a colicky character, and was due apparently to adhesions with the neighboring organs, gall-bladder, pancreas, etc., or to the ineffectual efforts of the stomach to force its contents through the constricted pylorus.

Czerny once said that a palpable cancer of the stomach is too advanced for removal. This did not prove to be the case in Körte's clinic, for a tumor was palpable in 34 of the 38 cases of resection. In one-half of these cases, however, there was only a painful sense of resistance or pressure. This was found on operation to be due in most instances to adhesions with the neighboring organs.

Lactic acid was present in two-thirds of the cases in which this test was employed for diagnosis. This is a late symptom and is due to the fermentation of retained food. *Hydrochloric acid* was absent in 90 per cent. of the cases tested. Unfortunately this symptom, which is one of the best diagnostic points known, does not always appear until rather a late period.

In making a resection Nordmann believes that the sense of touch is the most reliable guide to the limits of the tumor. Retroperitoneal glands were removed by opening into the lesser peritoneal cavity before opening the stomach. If enlarged glands were present in the omentum resection was not attempted. No one method of operating was practised exclusively, but different methods were followed, according to the condition of the exposed organs. The mortality of these various resections was 42 per cent. Of the patients who survived resection 13 died in from one to five years, and 9 were living at the time of report at from one to five years after operation. One of the above-mentioned 13 patients died of cancer of the liver more than four years after the tumor was resected from the stomach. One ought, therefore, to be very cautious in claiming freedom from recurrence after resection of the stomach for carcinoma.

Some have minimized the advantage of palliative operations in advanced carcinoma of the stomach, partly in view of the high mortality attending this operation in such patients, and partly because of their short expectation of life. The statistics of the 67 patients in this series upon whom this operation was performed give ground for a more optimistic view. The mortality from operation was not quite 20 per cent., while the patients who recovered from the gastroenterostomy were for the most part relieved of their most distressing symptoms and lived some weeks or months, with little or no vomiting. Such a patient is in a much better condition than one who has had a jejunostomy performed for carcinoma of the pylorus.

Preference was given to the retrocolic posterior method, advocated by von Hacker and often called by his name. No button was used in performing this or the anterior operations. The suture, a double one, was essentially that described by Moynihan, page 63, this number

of PROGRESSIVE MEDICINE. Suture of the stomach in the rent made in the mesocolon seemed to prevent any regurgitation of bile into the stomach, although in ten of the operations an enteroenterostomy was performed to make sure of the proper flow of bile into the intestine. The mortality in the 45 cases in which the posterior operation was employed was 15.5 per cent.

A PHYSICIAN'S VIEW OF THE SURGICAL TREATMENT OF PYLORIC CANCER. Steven[1] believes that in the present state of our diagnosis *pylorectomy* for gastric cancer can rarely be undertaken with much chance of success. The mere removal of a considerable portion of the stomach seems more of a shock than most such patients can stand. He gives brief histories of 13 patients treated by him, whom he turned over to the surgeons for operation, with the following results;

Pylorectomy advised but found to be impossible .	1 case (recovery).
Gastroenterostomy advised but pylorectomy performed, as the conditions seemed favorable when the abdomen was opened	2 cases (both died).
Exploratory operation advised and followed by—	
(*a*) Gastroenterostomy	6 " (5 recovered).
(*b*) Closing of the wound, as nothing could be done	4 " (3 recovered).

This table shows how well these patients bear an exploratory operation, so that one should not hesitate to advise it, to be followed by gastroenterostomy in all cases in which pain on the passage of food or vomiting show that the pylorus is obstructed. From his previous experience Steven is not inclined to advise pylorectomy in any case, unless the patient, fully aware of its great risk, prefers the slight chance it offers of a radical cure.

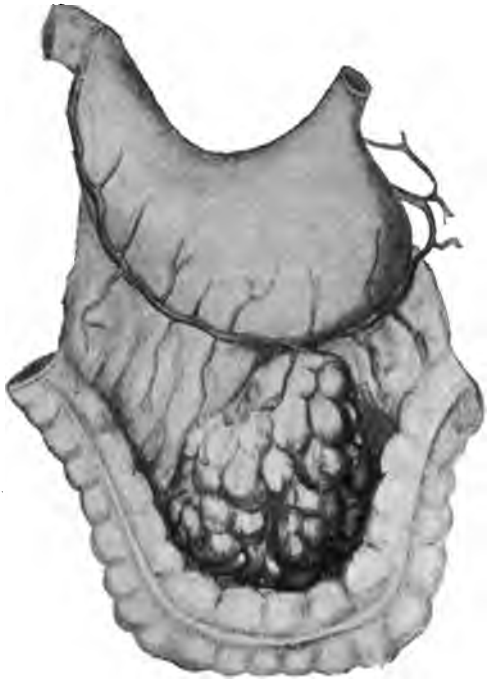
RESECTION FOR GASTRIC CANCER. Rydygier[2] advocates resection of the pylorus for carcinoma in two steps. At the first operation the stomach is cut across above the tumor, sutured, and a V-gastroenterostomy performed. Besides this a rubber tube is sutured into the pyloric portion of the stomach and brought out of the wound. This tube passes through the pylorus and well into the duodenum. Through it the patient can be fed until the second operation, if necessary, thus ensuring rest to the gastric suture while not depriving the patient of much needed nourishment. At the second operation the pyloric remnant of the stomach and a little of the duodenum are excised, and the duodenum is sutured. In this manner the risk to the patient is said to be less and the most thorough removal of the tumors is secured.

Resection. According to Kocher[3] the percentage of recoveries following resection of the stomach for carcinoma is constantly improving.

[1] Lancet, 1904, i. p. 1487.
[2] La Semaine Médicale, 1904, p. 332.
[3] Centralbl. f. Chir., 1904, p. 1315.

He reports 45 cases of partial resection performed by him since 1898, with a mortality of only 17 per cent. as compared to 44 per cent in 52 previous operations of this character, while the strictly operative mortality of these 45 operations is really only 5 per cent., 1 patient dying of perforation and 1 of gangrene of the colon. The other deaths were due to pulmonary conditions existing previous to operation. Twenty of these 97 patients were living at the time of report, 10 of them having survived operation for more than two years.

FIG. 9.



Shows diagrammatically the appearance of the tumor and its relation to the stomach and colon.

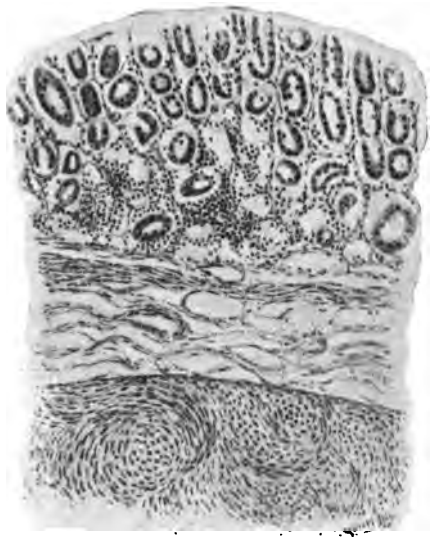
Sarcoma of the Stomach. While medical literature contains numerous articles on gastric carcinoma, sarcoma is seldom spoken of. This is due in part to its greater rarity and in part to the fact that the connective-tissue tumors either do not originate in the orifices of the stomach, or, if they do so, they do not produce constriction. Hence they may grow for a long time without obstructing the passage of food. Alessandri[1] describes a case of pedicled sarcoma of the stomach occurring in a woman aged fifty-six years. For four years she suffered from remittent fever, and about one month before coming under his observation she

[1] Mitt. aus der Grenzgeb. der Med. und Chir., 1903, vol xii. p. 455.

noticed an increase in the size of the abdomen. There was constipation but no disturbance of gastric digestion. Examination showed a rounded tumor in the left upper quadrant of the abdomen—movable in all directions, but least to the right and downward. It was not tender on pressure. Distention of the stomach with air caused it to cover the upper portion of the tumor. Distention of the colon showed it to lie along the lower border of the tumor. The spleen could not be outlined.

At operation the tumor was found to be embedded in the layers of the gastrocolic ligament, and to be connected with the stomach by a pedicle of less than an inch in diameter. It was removed together with the portion of the gastric wall to which it was attached. The patient

FIG. 10.



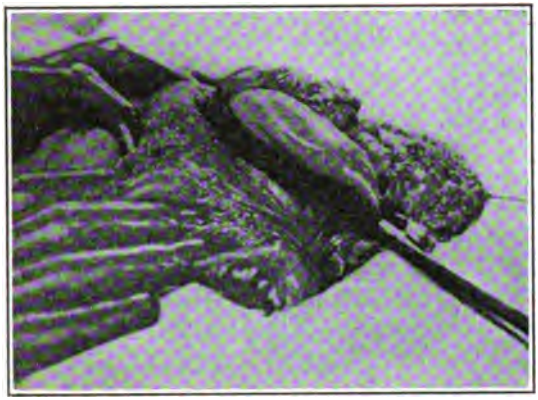
did well for a few days but died without fever on the thirteenth day. The wounds in the stomach and abdominal wall were perfectly healed and the cause of death was not apparent (Fig. 9).

Microscopically the tumor was a spindle-celled sarcoma. Its relation to the stomach is shown in the drawing of a section through the base of the pedicle (Fig. 10).

Alessandri describes briefly 19 other cases of primary sarcoma and mixed tumors of the stomach which he found recorded in literature. Some of these were pedicled like the tumor in his own case; some were diffuse; some of these tumors were discovered at autopsy. In other cases the diagnosis was made during life and operation performed. Four patients recovered. In 4 cases a fatal outcome was reported.

Technique of Gastroenterostomy and Enteroanastomosis. Moynihan[1] performs posterior gastroenterostomy by suture in the following simple manner:

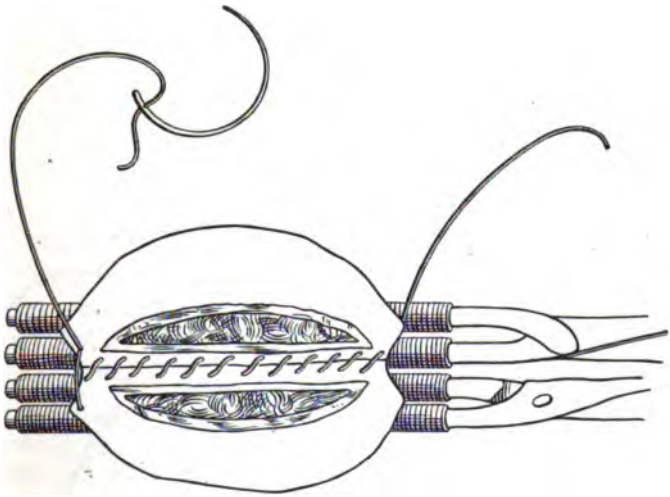
Fig 11



Clamps applied obliquely to the wall of the stomach, which is drawn through a vent in the mesocolon.

The abdomen is opened by splitting the fibres of the right rectus. The under surface of the transverse mesocolon is exposed and torn

Fig. 12.



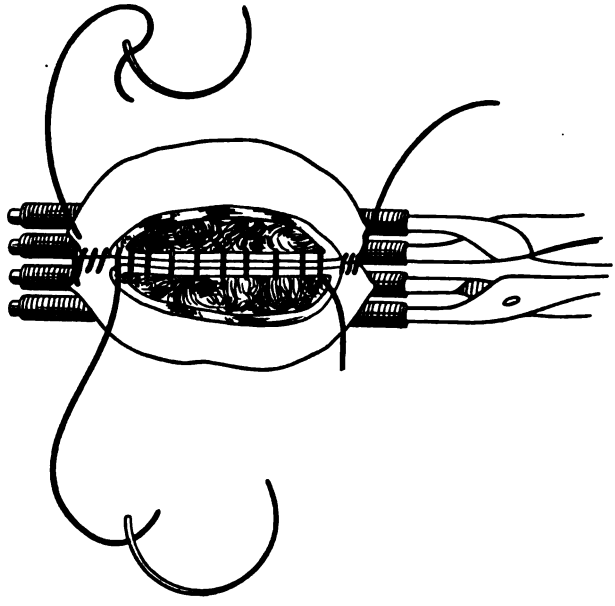
Beginning of serous suture.

through at the bloodless spot. The posterior wall of the stomach is drawn through this opening and seized with long clamps covered with rubber tubing (Fig. 11). The clamps extend from the lowest part of the greater

[1] Practitioner, 1904, vol. xix. p. 251.

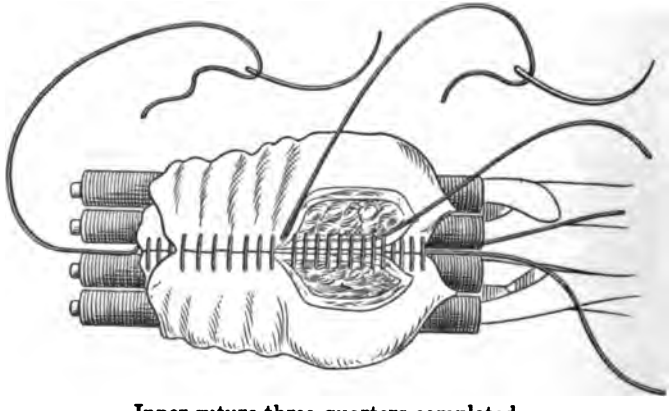
curvature obliquely across the stomach, more toward the cardiac than the pyloric orifice. The jejunum is brought to the surface and clamped longitudinally about seven inches from its origin. The two clamps

FIG. 13.



Inner suture half completed

FIG. 14.



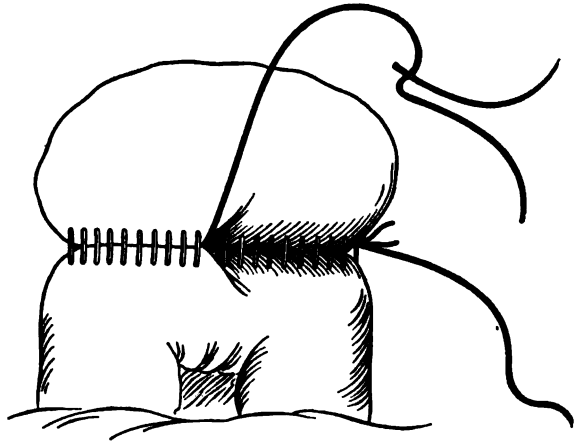
Inner suture three-quarters completed.

are laid side by side and the continuous serous suture is inserted (Fig. 12) for two or three inches. The stomach and jejunum are incised in front of this suture for a distance of about two inches and an ellipse of the

pouting mucous membrane is excised. The inner suture in then inserted through all the coats of the stomach and intestine (Figs. 13 and 14) beginning at one end of the incision and carried all the way around to the starting point. It is drawn tight and tied and the clamps are removed. If there is any hemorrhage or any weak spot, an interrupted suture may be inserted. The serous suture is then resumed (Fig. 15). The gut is then wiped with a swab wet in salt solution. Moynihan uses fine Pagenstecher thread and half-curved needles.

The natural place for an anastomosis between the stomach and jejunum is at their point of contact. In performing *antecolic gastrojejunostomy* it is necessary to leave sufficient slack between the duodenum and the point of anastomosis to surround easily the colon. In *retrocolic gastro-*

FIG. 15.



Serous suture three-quarters completed.

jejunostomy such slack is not needed—is, in fact, a disadvantage. Scudder prefers anastomosis by two continuous sutures, one introduced from the mucous surfaces, one from the serous surfaces.

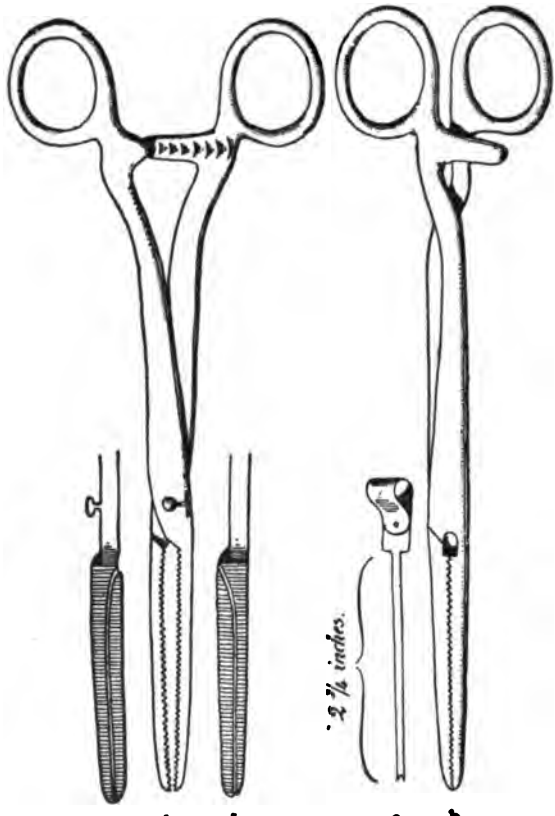
An English surgeon, Anderson,[1] insists on the following points as essential to success: (1) the site of junction—namely, the posterior aspect of the stomach as opposed to the anterior whenever possible and in but few cases is it impossible to effect a posterior junction; (2) shortness of the loop of bowel as measured from the duodenojejunal angle; (3) the obliquity of the incision into the stomach—namely, from below upward; (4) approximation as near as possible to the greater curvature; (5) removal of superfluous gastric and intestinal mucous membrane; and (6) immediate suturing with fine silk by an inner and outer layer

[1] Lancet, 1904, ii. p. 585

together, with the use of clamps during the process of suturing. In the after-treatment he lays special stress upon the importance of pillowing the patient up in a semirecumbent position as soon as the anæsthetic sickness has passed off, and the wisdom of early judicious feeding.

A case related by Barker[1] emphasizes the importance of the short jejunal loop. He performed posterior retrocolic gastrojejunostomy

FIG. 16.



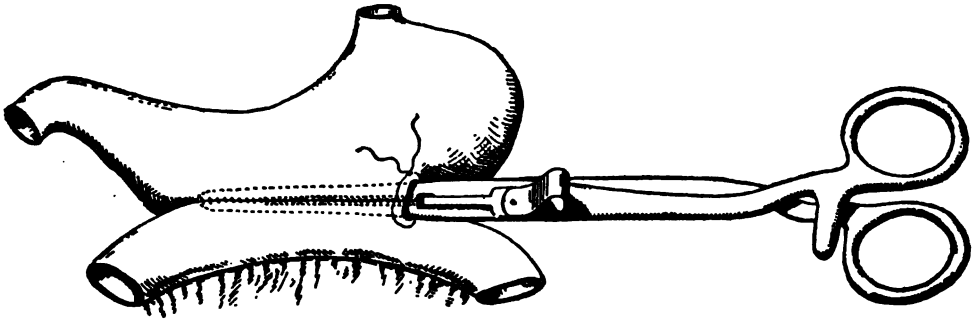
for gastric ulcer. The patient recovered perfectly and married and became pregnant. At the fifth month of her pregnancy, about two years after the operation, the intestines became obstructed. She promptly called her surgeon, who opened the abdomen and found the whole mass of small intestine had twisted from the patient's left to right. When this twist was relieved it was further seen that the whole small intestine

[1] Lancet, 1904, ii. p. 1277

had passed from below upward behind the anastomosed jejunal loop, and passing over it had formed the volvulus in front of it.

Gilbert[1] suggests a rapid method of performing gastroenterostomy or enteroenterostomy by a single continuous serous suture. A longitudinal groove is cut in each blade of a long straight pair of Pean's elastic forceps. These two grooves form a bore from end to end of the blades when the forceps are closed. Through this bore a special fine knife can be passed. A small opening is made in stomach and jejunum at one end of the future anastomosis, the forceps are passed and closed, fixing the two walls in apposition. A continuous suture is applied—an easy procedure, as the forceps act as a handle to present the parts for suture. When the suture is everywhere complete except at the handles of the forceps, the knife is passed through the bore of the forceps, cutting both stomach and jejunum the required distance. The forceps

FIG. 17.



are unclamped and withdrawn, and the remaining gap is sutured. The escape of gastric and intestinal contents is prevented, and there is a minimum handling of the parts.

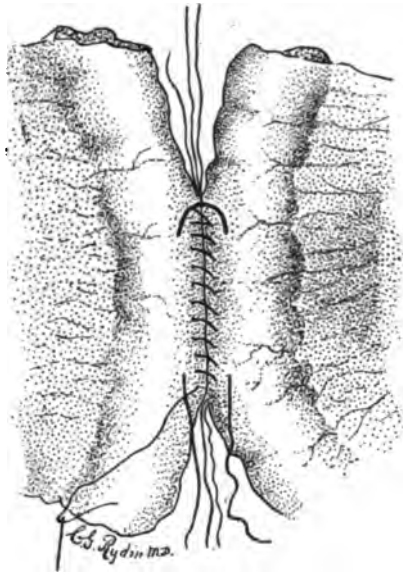
Werelius[2] accomplishes this intraintestinal division of the walls by means of a silver wire or stout thread inserted as in Fig. 18, when the seroserous suture is half-completed. When the suture is finished all but one stitch, the wire is made to cut its way out by sawing, pulling on its ends alternately while an assistant holds the parts firmly. This has been tested upon animals.

Sato[3] suggests a method of anastomosis of stomach or intestine without opening the lumen. The serous and muscular coats are dissected away for an appropriate distance, and then a smaller area of mucous membrane is cauterized with nitrate of silver. The excess of caustic is wiped away and the two portions of intestine are sutured. Numerous experi-

[1] Medical Record, 1904, vol. lxvi. p. 957.
[2] Journal of the American Medical Association, 1904, vol. xliii. p. 1230.
[3] Wiener klin. Wochenschrift, 1904, No. 7.

ments on animals showed that mucous membrane so treated necroses within twenty-four hours. The advantages urged for this method are protection of the peritoneal cavity from infection, the ease with which anastomosis is performed, even without an assistant, if necessary, and the fact that no previous preparation of the bowel by cathartics, etc., is necessary, as the lumen is not opened until the serous surfaces have become firmly attached.

FIG. 18.



Maury,[1] whose experiments with the *elastic ligature* were reported fully in PROGRESSIVE MEDICINE, June, 1904, announces that he has found twine superior to rubber for this purpose. Any strong twine will answer, perhaps a fish line is as good as any other. It can be sterilized by boiling, it does not deteriorate with age as does the elastic, and it is easier to introduce than the elastic. He now recommends a triangular stitch instead of the quadrilateral previously described, for it can be introduced more rapidly, and experiments show that it punches out a good-sized opening.

Harrington[2] describes a *segmented ring* which he has invented to facilitate intestinal anastomosis, and reports 9 anastomoses between different portions of the alimentary tract performed with the aid of the ring; also 22 experiments upon animals. The ring is made in four segments, held together by a fine rod until the suture is complete.

Gasset[3] who tested upon the cadaver the suggestion of Biondi to unite the *œsophagus and stomach* through the pleural cavity and through the diaphragm, believes that three operations are anatomically possible: (1) a lateral anastomosis between the œsophagus and the stomach; (2) implantation of the œsophagus in the greater curvature of the stomach (exclusion of the cardia); (3) implantation of the œsophagus in the jejunum (exclusion of the whole stomach). He believes that the outcome of such an operation will depend largely on the effect of thus mixing as it were the intrathoracic and intra-abdominal pressure. He has performed an *œsophagogastrostomy* on a dog with success.

[1] Journal of the American Medical Association, 1905, vol. xliii. p. 796.
[2] Annals of Surgery, 1904, vol. xl. p. 748.
[3] Revue de Chirurgie, 1903, vol. xxviii. p. 694.

THE INTESTINES.

It is difficult to classify articles written on the diseases of the small intestine, large intestine, appendix, and peritoneum for the reason that the effects of an injury or inflammation in one of these divisions extends to another, and writers allow themselves at least as wide a range as the pathological processes. Therefore, the reader should consult not only the articles on the subject in which he is interested, but the others as well, and especially those grouped under the title Peritoneum.

Rupture of Small Intestine. Knaggs[1] reports two cases of rupture of the small intestine from a crushing blow without external wound. The question of operation in these doubtful cases is always a difficult one. Knaggs believes that vomiting occurring after the initial shock is the most important symptom, and if accompanied by a slowly rising pulse exploration is clearly justified. To operate after every severe abdominal contusion he holds to be unjustifiable; yet the tendency on the part of American surgeons is clearly in favor of early operation after such injury whenever the symptoms do not constantly improve. This practice may result in some unnecessary operations, but delay forfeits many lives. One of Knaggs' patients operated upon on the day following injury did not recover. His intestine was ruptured at the junction of the duodenum and jejunum. Operation upon the other patient, a thirteen-year-old girl, was delayed for thirty-six hours. The perforation in this case was lower down, and very small. Even so, the intestinal coils were matted together with yellow lymph and very offensive pus lay between them. Bloody feces exuded from the perforated bowel and had collected in Douglas' pouch. Infectious material had also collected in the left kidney pouch. The abdomen was cleansed by wiping (?), the perforation was sutured, and three gauze drains and one rubber drain were inserted. The patient made a complete recovery in six weeks. It is interesting to observe that after nearly two years of good health the patient suffered from an abdominal abscess, which in a week burst through the scar and discharged most offensive pus. The sinus closed in three weeks and there was no further trouble up to the time of report, some two years later. The great pain caused by a laxative seemed to indicate the persistence of adhesions. This prolonged period of convalescence is also an argument for early operation. It is a good thing to save the patient's life; it is still better to save it so promptly that he will not suffer afterward from an abdominal abscess and adhesions.

Acute Intestinal Obstruction. *Diagnosis.* White[2] reviews some of the conditions most likely to be mistaken for acute intestinal obstruc-

[1] British Medical Journal, 1904, i. p. 832.

[2] Lancet, 1904, i. p. 791.

tion. He mentions a case of appendicitis in which the slight initial fever, the general tenderness and distention of the abdomen, the absolute stoppage of the bowels, with continued vomiting becoming stercoraceous, seemed to indicate intestinal obstruction. The appendix had perforated early and the resulting small abscess and local peritonitis had really obstructed the small intestine.

Differential diagnosis between acute obstruction and *acute peritonitis* is increasingly difficult as the case progresses, for obstruction often leads to peritonitis. In favor of obstruction are these symptoms: rapid, feeble pulse; an ashy, pinched countenance; rapid distention of the abdomen which is not "board-like;" increased peristalsis; early and violent vomiting becoming stercoraceous; agonizing paroxysmal pain referred to the umbilicus; absence of pyrexia and leukocytosis, and cutaneous hyperæsthesia. The abdomen moves with respiration in the early hours of the obstruction.

In *acute pancreatitis* the bowels can usually be moved, the vomiting does not become stercoraceous, and the abdomen is not distended unless acute peritonitis develops.

Rupture of stomach or intestine is often suggested by the previous history, and the symptoms are likely to be more severe and sudden than those of obstruction. The abdomen usually becomes immobile and distended, and peritonitis develops early.

Thrombosis and embolism of the mesentery give symptoms closely resembling those of acute obstruction. The vomiting occurs early and may become stercoraceous, but it is not so prominent a symptom. If a large part of the mesentery is affected the distention is rapid and extreme. This affection almost always occurs in persons who have diseased hearts.

In *intestinal colic due to lead*, vomiting is not a marked symptom. Severe intestinal colic due merely to faulty diet is not common in adults, while intestinal obstruction, aside from intussusception, is rare in children. In doubtful cases the increase in the severity of the symptoms will in a few hours serve to distinguish simple colic from obstruction, provided no opiate is given.

Acute intussusception produces bloody diarrhœa and often some pure blood, and then constipation, while the movements in a case of severe enteritis always contain some fecal matter in addition to the blood and mucus; a tumor is palpable at least under anæsthesia.

Twist of the pedicle of a *pelvic tumor*, or *rupture of a dilated Fallopian tube*, an *extrauterine pregnancy*, or an *ovarian cyst*, may lead to mistaken diagnosis. The location of the lesion or the presence of a tumor with the history will serve to distinguish them from intestinal obstruction.

Hysteria, biliary and *renal colic* have all been mistaken for intestinal obstruction.

White asserts that the early symptoms of acute intestinal obstruction are caused by the strangulation of the bowel and not by the obstruction to the passage of its contents. Thus in obstruction due to a gallstone the symptoms are not very acute, while in volvulus they are very acute. In intussusception the symptoms are severe in proportion to the strangulation. Persons have been known to go a month without a movement of the bowels, the colon being full of impacted feces, and yet without any serious symptoms.

ORIGIN OF SYMPTOMS OF OBSTRUCTION. Clairmont and Ranzi[1] give the details of a long series of experiments upon animals to determine the formation of a poison in an obstructed intestine, and the effect of this poison upon the animals. They satisfied themselves that such a poison is formed in the ligated intestine of an animal and also in the human intestine when obstruction comes on spontaneously. Just what the nature of the poison is they were unable to determine. They proved, however, that the dilated portion of the intestine, proximal to the point of strangulation is in a state favorable to the absorption of any poisonous products within it. Thus the theory that autointoxication accounts for the toxic symptoms which are present in cases of ileus is supported by these experiments. The investigators hope at a later time to ascertain whether serum treatment will help to overcome the severer symptoms, such as coma and convulsions.

INTESTINAL OBSTRUCTION FROM IMPACTED GALLSTONE. Bridges[2] was called to see a stout woman, aged sixty-eight years, who had complained for three years of indefinite abdominal pains, worse at intervals. There was no jaundice. After a period of six weeks during which her symptoms were aggravated and she lost in weight, she was seized with pain in the left lumbar and umbilical regions, and vomited repeatedly. A few hours later her condition was worse. A diagnosis of intestinal obstruction was made, and the abdomen was opened above the umbilicus. On lifting the great omentum both collapsed and distended small intestine was seen and the site of obstruction located. A concretion was felt, cut down upon, and removed. The wound in the bowel was promptly sutured, but although the whole operation did not last more than thirty minutes, the patient was unable to rally. The concretion proved to be a gallstone, measuring seven-eighths of an inch in its greatest diameter. Unfortunately no post-mortem examination was made. At operation the hepatic region was examined but nothing abnormal found.

[1] Archiv klin. Chirurgie, 1904, vol. lxxiii. p. 696.
[2] British Medical Journal, 1904, ii. p. 19

Obstruction from Syphilitic Ulcer. Elder[1] mentions an instance of this very rare condition, so rare that some authors do not mention it, and others simply say that syphilitic ulceration of the intestine higher up than the rectum is rare. The patient in question was a man aged twenty-three years, who suffered for a month with pains in the stomach after eating, without vomiting or loss of flesh. There was alternate diarrhœa and constipation. Half an hour after a stool he was seized with sharp intermittent umbilical pain with persistent rectal tenesmus and nausea, but no vomiting. Collapse and abdominal distention followed with muscular rigidity. An exploratory incision was made. The peritoneal cavity contained serum and lymph, but no food or feces. About two-and-one-half feet above the ileocæcal valve the small intestine was closely surrounded by omentum and bound to the posterior peritoneum. These adhesions were old and firm. Their division did not relieve the intestinal distention above this point, and as a stricture of the intestine itself was palpable, resection of some three inches and a circular enterorrhaphy was performed. The patient recovered. The immediate cause of the acute obstruction was ulceration of the mucosa by which a bloodvessel was eroded. The blood stripped the mucosa from the muscularis, and the hæmatoma thus formed completely obstructed the already narrowed lumen of the bowel. The diagnosis of syphilis was confirmed by the presence of a typical tertiary ulcer of the eyelid, which healed under mercury.

Intestinal Obstruction after Typhoid Fever. Goodall[2] reports two cases of obstruction by peritoneal adhesions due to typhoid fever. A boy, aged fourteen years, on recovering from a typhoid suffered from acute abdominal symptoms—vomiting, hiccough, and pain. These symptoms lasted three days and were thought to indicate a relapse. Three weeks later the symptoms recurred and the patient died. The small intestine was obstructed about thirty inches above the ileocæcal valve by a fibrous band, the result of peritonitis opposite a deep typhoid ulcer. The other patient, a man aged twenty-two years, was operated upon for perforation. No adhesions existed at that time, nor was there any generalized peritonitis. Two weeks later the patient began to vomit. A week afterward other symptoms of obstruction appeared, and the patient died suddenly. The small intestine was found to be kinked and compressed by adhesions in several places, and an ulcer situated just above the highest band had perforated. This was six feet above the ileocæcal valve.

It is rather surprising that deaths from adhesions following typhoid

[1] British Medical Journal, 1904, i. p. 1068.
[2] Ibid., i. p. 838.

fever are rarely recorded. In Nothnagel's system of medicine this cause is not mentioned, although to perforative peritonitis is ascribed 16.5 per cent. of deaths from typhoid in Leipsic, 14 per cent. in Hamburg, and 31.7 per cent. in Johns Hopkins, Baltimore.

OBSTRUCTION DUE TO ADHESIONS. No better illustration can be given of the danger of leaving raw surfaces in the peritoneal cavity than the history given by Hayes[1] of a young woman from whose pelvis a cystic tumor was removed. The adjacent coils of small intestine were adherent to the tumor. The patient did well for four days and then began to vomit so frequently in spite of one evacuation of the bowels that the wound was reopened on the ninth day. One loop of small intestine was found to be adherent to the scar of the incision by a broad band. In separating it the peritoneum was torn from the intestine for a distance of about two inches. This adhesion had kinked the intestine and produced the obstruction. Again the patient did well for four days, then severe vomiting recurred with constipation, and the abdomen was opened a second time and the loop of intestine freed and brought into the upper angle of the wound. Seven days later it was necessary to reopen the abdomen for the third time on account of adhesions and kinking of this denuded loop. This time it was brought quite out of the peritoneal cavity. For two or three days the patient suffered much pain and vomited many times. Then the bowels began to act regularly and all the symptoms of obstruction subsided. The loop of intestine became covered by granulations and gradually shrank into the abdominal cavity, so that it required no further treatment.

INTESTINAL OBSTRUCTION. TREATMENT. Barker[2] gives some rules which he has found valuable in the treatment of intestinal obstruction. Most of these patients are not seen until the contents of stomach and intestine have undergone fermentative and even putrefactive changes. He advocates washing the stomach by means of a stomach-tube several times until it is thoroughly cleansed. This is done before an anæsthetic is given. The mouth and throat are then washed with a warm antiseptic alkaline fluid, and the patient is given a hot drink of brandy and water. A very feeble patient is also given subcutaneously a pint of saline solution or a 5 per cent. glucose solution. This is isotonic with the blood, is therefore easily borne, and acts as a food as well as a drink. A rectal injection of warm saline solution or brandy and water is also helpful.

Barker inclines more and more to the use of a local anæsthetic, feeling that the chances of recovery are often reduced by the administration of a general anæsthetic to a patient whose respiration is embarrassed

[1] Lancet, 1904, i. p. 1500.

[2] Ibid., ii. p. 809.

by abdominal distention, and whose strength has been lowered by fasting, vomiting, and the absorption of toxic intestinal products. He usually gives a little chloroform for a few minutes when the root of the mesentery is operated upon, for instance, if resection is performed. This method is less suited to the young and nervous than to the mature and the aged.

When the abdomen is opened search should first be made for a loop of empty bowel in the right iliac fossa as a guide to the obstruction, which is usually low down. The relief of the obstruction requires no special rules, but in performing this act and in emptying a distended loop after incision the intestines should be kept within the abdominal cavity as far as possible.

It is often difficult to decide what to do with the distended and injured intestine. On this point Barker says: "From experience we know that this bowel is most probably ulcerated internally not only at and just above the constriction but often for a foot or two upward. What are we to do in such a case? To return the bowel after simply relieving the obstruction is to allow pints of fermenting feces either to remain stagnant or to escape into the empty, and as it were hungry, bowel below with all the risks of more abundant absorption of the poison than before. If this is not done one of two alternatives remains. Either we must temporarily drain the distended gut or boldly resect several feet of it with their contents and unite the upper and lower portions. Of the two I prefer the latter course. By this means we remove at one sweep all the septic bowel and its contents and with these the greatest dangers to the patient. These are the dangers of peritoneal infection with or without sloughing or perforation of the bowel and of toxæmia from absorption of its liberated contents as they pass into the intestine below. For the last five years I have generally acted on this principle with results far superior to any I was able to obtain previously.

"One point is perfectly clear from the experience of these recent cases —namely, that there is no more shock from removing several feet of bowel than there is from taking away a few inches. Again, we need to be reminded that the anastomosis of the remaining parts is equally easy or difficult independent of the length of the part resected. Let it be remembered that if the bowel be distended to only two inches in diameter every foot of it will contain more than one pint of putrid material."

Barker closes the abdomen without drainage unless general peritonitis is present. He urges these patients to sit up in bed from the first, and when they lie down to lie upon one side or the other so as to overcome the tendency to hypostatic pneumonia. One old woman was in an arm chair by the fire in six days. Ten grains of carbonate of bismuth are given by mouth three times daily. Albumen-water and brandy are

given by mouth almost immediately, and light food in a few days, especially if resection has been performed.

Taylor[1] after reporting 13 cases of intestinal obstruction speaks of the benefit derived from *gastric lavage* subsequent to the operation when the stomach is filled with stercoraceous material. He believes equal relief will follow emptying the intestine. For this purpose he advises the method recommended by Kocher for the treatment of general peritonitis. An opening just large enough to admit the nozzle of a syringe is made high up in the jejunum and another opening is made low down in the ileum for the escape of fluid. By this means a stream of water is passed through almost the whole length of the intestine, and its contents are thoroughly evacuated. Both openings are then sutured, and the two loops of intestine are replaced in the abdomen.

Ranzi[2] reports the result of operations performed in Eiselsberg's clinic in Vienna for the relief of *ileus*. There were 23 cases of obstruction due to tumors or inflammatory exudates with 11 recoveries; 11 cases of strangulation by bands with 5 recoveries; 3 cases of volvulus all fatal, and 1 case of ileus due to pancreatic hemorrhage, also fatal. This gives a percentage of recovery for the whole series of only 42 per cent., which is sufficiently discouraging, and is really still more so when it is noted that most of the patients who recovered were simply treated by freeing of adhesions, or colostomy, or enterostomy. In the list of recoveries from the operation for the relief of ileus is included one colostomy, the patient dying from bronchitis eleven days after the operation. Enterostomy was performed 8 times with 6 deaths; enteroanastomosis 6 times with 4 deaths, and resection of the intestine 5 times with 4 deaths soon after, and a fifth one as a result of a second operation to close a resulting fecal fistula.

Many of the patients who came to operation had suffered from the effects of the ileus for days, only a few of them having had severe symptoms for less than three days. This factor alone counts strongly against a high percentage of recovery, even after the simplest abdominal operation. A number of the patients already had a well-marked peritonitis at the time of operation. Great credit is due to those who report thus frankly the unpleasant truths of surgery as well as the happier results.

Ranzi emphasizes the necessity of earlier interference in these cases. He advocates a radical operation whenever possible—viz., the extirpation of a tumor, enteroanastomosis, or resection of a gangrenous loop of strangulated intestine. The condition of the patient, however, usually makes it wiser for the surgeon to content himself with the relief of the

[1] Dublin Journal of the Medical Sciences, 1904, vol. cxvii. p. 321.
[2] Archiv klin. Chirurgie, 1904, vol. lxxiii. p. 783.

ileus in the quickest and simplest way, leaving more radical measures for a subsequent operation.

The percentage of recoveries in this list of cases is slightly above the average for the last ten years by prominent Continental surgeons. Ranzi gives the following table:

Operator or author.	Year.	No. of cases.	No. of recoveries.	Per cent.
Schramm	1884	190	68	35.7
Schede	1887	26	8	30.7
Obalinski	1894	110	38	34.5
Heidenhain	1897	30	14	46.6
Kocher	1899	78	56	71.7
Bergmann	1900	66	15	22.7
Mikulicz	1900	70	34	48.5
Pruts	1900	36	19	52.7
Zeidler	1900	17	8	47
Hepner	1902	31	15	48.5
Philipowicz	1903	67	25	37.3
Ranzi	1904	37	15	42.1
Total		758	315	41.5

These figures show very plainly the need of an earlier decision to operate even if the diagnosis is not exact. It is enough for the surgeon to know that something is wrong in the abdomen. In a recent article Wiggin[1] says: "It must constantly be kept in mind that a severe, sharp, and persistent abdominal pain almost invariably means peritoneal involvement provided the chest has been carefully examined and its diseases excluded, and that sudden cessation of such a pain accompanied by a rise of pulse rate and increased frequency of the respiration with or without a lowering of the bodily temperature usually denotes gangrene of the gut and its perforation. Many lives will be saved and thousands of others made more comfortable when physicians generally come to recognize that in all cases of persistent abdominal pain of obscure origin exploratory operations should be performed, for it has been my experience that a cause always does exist when such a pain is present, and that it is usually found with ease when looked for. Osler has wisely said, 'The surgeon is often called too late, never too early.'"

ACUTE INTUSSUSCEPTION. TREATMENT. Wallis[2] reports 4 successful operations for intussusception in children of two years or younger. No attempt was made to reduce the intussusception by manipulation or rectal injections, as Wallis believes that such methods should not be practised and *should not be taught*. The usual results of such treatment are loss of time, with loss of vitality of the infant, continuance of starvation, and a possible rupture of the intestine. In 2 cases the incision

[1] Lancet, 1904, vol. ii. p. 213.

[2] Ibid., i. p. 1648.

was in the right semilunar line, and in 2 cases in the median line, according to the situation of the tumor felt under anæsthesia. The intussusception was in all cases at the ileocæcal valve. The affected portion was lifted out of the abdomen, reduced and returned. No attention was paid to the thickened and inelastic condition of the invaginated bowel, as this quickly recovers. The incision was closed in one layer. The time of operation in the 4 cases was, respectively, twelve, fifteen, nine, and ten minutes. Feeding was commenced in each case a few hours after operation. Early diagnosis is essential to a speedy recovery, and it is not necessary to wait till a tumor can be felt. Vomiting and the passage of blood-stained mucus coming on suddenly in an otherwise healthy child are sufficient indications for an anæsthetic to be given. When the abdominal walls are relaxed any tumor present can be felt and dealt with.

Erdmann[1] advises a rectal injection provided the intussusception has not lasted more than six hours. He says this facilitates the reduction at operation, but in no case should operation be decided against because the injection has apparently entirely replaced the intussusception, because a small remaining intussusception at the ileocæcal valve may be thus overlooked, as one of his cases showed him. Had he trusted to an apparent reduction and not operated until later, a resection would have been necessary.

Multiple Intussusception. Riedel[2] operated upon a child for invagination of the intestine and found the ileum to have entered the cæcum and colon in the usual manner, while a retrograde invagination of the splenic and descending colon existed. There was also evidence of a third invagination which had been felt during life and had apparently been reduced by ingestions of water.

Intussusception Starting in Meckel's Diverticulum. It is known that Meckel's diverticulum may become inverted. According to Cheyne[3] 16 such cases have been reported and he adds a seventeenth from his own experience. Sometimes no other lesion has been found; sometimes the invagination has not stopped with the limits of the diverticulum, but has involved a part of the small intestine. Treatment is, of course, resection. In this way Cheyne saved his patient.

Chronic Intussusception. Wallis[4] removed forty-two inches of small intestine on account of an invagination which had lasted over two years. During this time the patient had several attacks of abdominal pain and vomiting, but between them she enjoyed excellent health.

[1] New York Medical Journal, 1904, vol. lxxix. p. 919.
[2] Mitt. aus der Grenzgeb. der Med. und Chir., 1904, vol. xiv. p. 218.
[3] Annals of Surgery, 1904, vol. xl. p. 796.
[4] Clinical Society Transactions, 1904, vol. xxxvii. p. 42.

The tumor could not be felt except in complete anæsthesia. The appearance of the specimen is shown in Fig. 19.

Riedel[1] cites a case of invagination of the intestine, the details of which lend support to Nothnagel's theory that invagination is due primarily to circumscribed contraction of the intestine. The spontaneous disappearance of the invagination which sometimes occurs is attributed to a relaxation of this contraction. Riedel's patient suffered for fourteen years with attacks of abdominal pain and swelling with vomiting and diarrhœa, lasting one or two days, and then entirely disappearing.

FIG. 19.

Chronic invagination of small intestine. (WALLIS.)

Such attacks came on every two or three months. In one attack more severe than usual the patient noticed a hard mass as big as a hen's egg in the right side. This disappeared with all other symptoms in twenty-four hours. From this time on the attacks were more frequent, every two weeks, and the mass was regularly felt in the attacks. The only treatment was that of hot applications. Finally an attack came on so violent that a physician was summoned. In spite of the evidently increased peristaltic movements he made a diagnosis of perforative appendicitis and sent the patient to a hospital. No tumor could then

[1] Mitt. aus der Grenzgeb. der Med. und Chir., 1904, vol. xiv. p. 229.

be felt on account of the abdominal distention, even when the patient was completely anæsthetized. The lower portion of the ileum was found invaginated into the ascending colon and already gangrenous. The constriction about it was very firm. An anastomosis was made between the healthy ileum and ascending colon and the gangrenous portion of intestine resected. The patient survived the operation only to die in three weeks of pneumonia secondary to an infected thrombus in the right iliac vein.

Volvulus of the Small Intestine. Volvulus of the entire small intestine on its mesentery is an accident likely to prove fatal, even if the patient is treated by operation, for as Vaughan,[1] who collected reports of twenty-one cases points out the condition is one of strangulation of the whole small intestine with injury of the sympathetic plexus and a severe toxæmia. Operation to be successful must be quickly performed, and when the abdomen is opened the recognition of the cause of the strangulation is by no means easy.

Whiting[2] reports two such cases, one patient dying without operation, while the other recovered after the abdomen was opened and the twist was relieved. This was done within four hours of the onset of the attack.

Roberts mentions a case in which operation revealed the true cause of the trouble but failed to save the patient.

Thrombosis and Embolism of the Mesentery. In his lectures on acute infective gangrene of the alimentary tract, Corner[3] says that about 150 cases of embolism and thrombosis of the visceral vessels of the abdomen have been reported. Most of these have been in the nature of pathological reports, but of late years since the attention of surgeons has been directed to these lesions, there have been also a good many attempts during life to avert the fatal issue. Few indeed have as yet succeeded, but even a few cures give encouragement for a prompter treatment.

In almost all cases the clot comes from the left auricle, taking its origin in mitral disease. Blockage of the arteries is more common than that of the veins in the proportion of 5 to 1. Involvement of the superior mesenteric artery is forty times as common as that of the inferior mesenteric, a disproportion which Corner believes to be made unduly striking by the fact that almost all of our knowledge of this disease is from the fatal cases. Anatomically it may be inferred that the organs supplied by the cœliac and by the inferior mesenteric will not become gangrenous if these vessels are occluded since there is such free anasto-

[1] American Journal of the Medical Sciences, 1903, vol. cxxv. p. 799.
[2] Annals of Surgery, 1904, vol. xxxix. p. 1037.
[3] Lancet, 1904, vol. i. p. 1334.

mosis. Experiments upon dogs confirm this supposition. They also show that stoppage of the superior mesenteric will produce grangrene of the small intestine, doubtless for the reason that although not strictly a terminal artery anatomically, it is one physiologically on account of the great length of the intestine which it supplies (twenty-five feet in man). Yet even in these cases there is great variation in the amount of small intestine which becomes gangrenous, and in the length of time which the patient can live after the occurrence of the attack. The virulence of the bacteria present also seems to have an important relation to the extent and character of the damage done. These and other points have yet to be established by further reports of the conditions seen during life. From data already at hand Corner has prepared the following tables:

Clinical Table.

1. Obstruction of the mesenteric vessels is most common in men past middle life.
2. It is most common secondary to valvular disease of the heart, especially mitral disease.
3. The onset is generally sudden with symptoms of peritonitis.
4. In one class the picture is one of intestinal obstruction or peritonitis due to appendicitis or the perforation of a gastric ulcer.
5. There is also another class in which blood is passed per rectum and which signifies infarction of the bowel.
6. Subacute and chronic cases are seen as well as the most acute.
7. In some cases there is probable spontaneous recovery, especially if only a small area of the bowel is rendered bloodless.

Pathological Table.

1. For a constant situation of the embolus in the superior mesenteric artery as in the main trunk all varieties of clinical cases have been reported, from the most acute and fulminating to cases like Chiene's[1] that recovered apparently without obvious symptoms.
2. With a precisely similar lesion some subjects die in thirty hours and some live from twelve to twenty days.
3. Gangrene of the gut has been noticed to occur within thirty hours and sometimes not after twenty-two days.
4. A collateral circulation can be formed in slowly developing cases of visceral vascular obstruction—*e. g.*, Chiene's case; and even in more acute instances an attempt at a collateral circulation is made.

[1] Journal of Anatomy and Physiology, 1869, iii. p. 65.

5. The superior mesenteric artery is almost invariably picked out for the site of the embolus in fatal cases, possibly because it will always cause symptoms and almost always death, which need not occur with involvement of the inferior mesenteric and its branches or those of the cœliac axis.

6. The explanation of the individual variations, clinical and pathological, seems to depend upon the pathogenicity of the bacteria present in the gut. On the bacteriology of this affection there is no work done.

Jackson, Porter, and Quinby[1] say that the only rational treatment is exploratory laparotomy as soon as even a tentative diagnosis has been made. From the cases hitherto reported it appears that resection and suture is more of an operation than these patients are able to bear. Furthermore, it is often difficult to tell after the abdomen has been opened whether the gangrene has reached its limit. Hence, these writers recommend a more conservative procedure and one which is less likely to depress the patient as much as resection and suture. The involved loop is brought well out of the wound, so that there is a good margin of healthy intestine at either end. The peritoneum is flushed through a Tait tube if peritonitis is present. The cavity is then protected by gauze and the diseased portion of intestine is resected. The distention of the intestine will be relieved by this short operation, the patient will be protected from extension of the gangrene, and peritonitis may be avoided. If the case progresses satisfactorily, a secondary resection and suture can be performed.

The severity of this affection is shown by the fact that in their list of 247 cases there are only four recoveries noted. A fifth patient treated by the method described above was awaiting a secondary suture at the time of the report.

Kenerson[2] reports 3 cases of gangrene of a single loop of small intestine due to thrombosis or embolism. In the case of two men of middle life the condition came on without evident cause. In the third case a nine-year-old boy was kicked in the abdomen several times by a companion. Resection was performed in the case of this boy with success. Resection was performed upon one of the men without success. On account of the bad condition of the other adult at the time the abdomen was opened, resection was not attempted. The appearance of the abdomen in this case is shown in Fig. 20.

Payr[3] mentions 4 cases in which thrombosis of some of the branches of the *portal vein* followed operation. In 4 cases the veins of the omen-

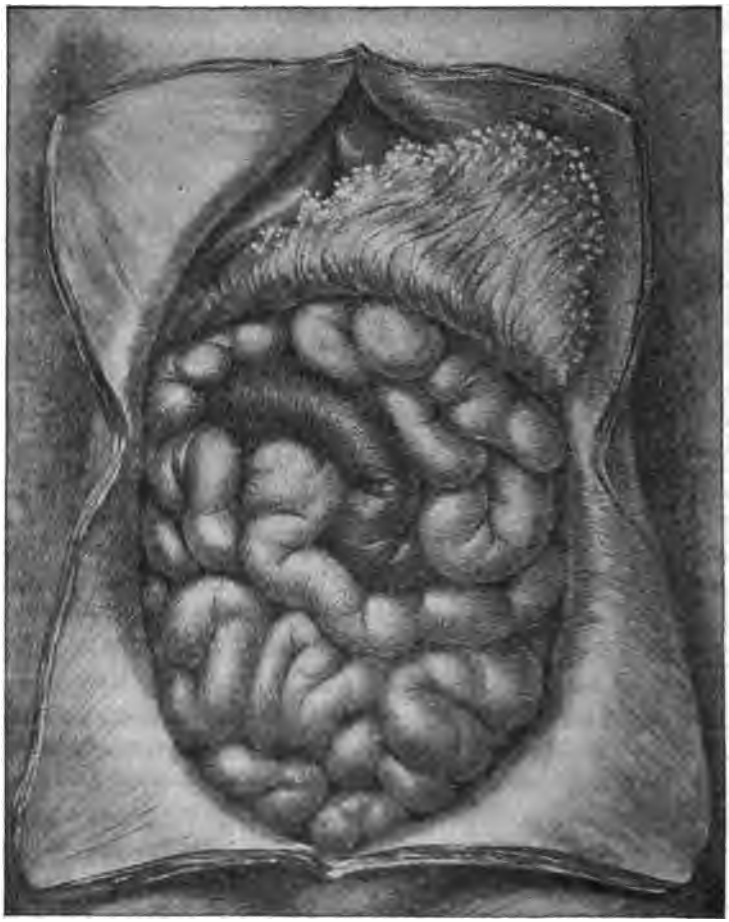
[1] Journal of the American Medical Association, 1904, vol. xlii. p. 1469; vol. xliii. pp. 25, 110 and 183.

[2] Annals of Surgery, 1904, vol. xl. p. 364.

[3] Centralbl. f. Chirurgie, 1904; Beilage, p. 59.

tum were affected. Three of these operations were for appendicitis and one for a stab wound. In all 4 cases it was noted that the omentum was more or less inflamed, but it was not gangrenous, and it was not subjected to any injury other than separation of any existing adhesions. At the close of the operation it was noted that either the whole omentum

FIG. 20.



Appearance of the abdominal cavity in the second adult case of mesenteric thrombosis. One intestinal coil black, but surrounded by other coils of normal appearance. (KENERSON.)

or a portion of it was so affected by thrombosis of its veins that resection was necessary. Three cases of venous thrombosis of the mesentery or mesocolon are also mentioned, necessitating resection a second time, and in one case a third time on account of extension of the thrombosis and threatened gangrene of additional intestine. The original

operation in these 3 cases was for strangulated hernia. One of the patients recovered.

Perforation of the Small Intestine in Typhoid Fever. It has been said[1] that at least 16,000 patients die annually from typhoid perforation in the United States alone, and yet only a few are operated upon. This is in part due to the uncertainty of the diagnosis and in part to the forlorn condition of the patient. And yet 25 per cent. of recoveries is by no means unusual. According to Harte[2] there were 30 per cent. of recoveries in the 146 operations reported between 1899 and 1903. Many failures may not have been reported, but equally good results have been obtained in consecutive series of operations under favorable hospital conditions (37 per cent. at Johns Hopkins). If the perforation occurs in a child between six and fifteen years the prognosis after operation is twice as good according to Elsberg[3] (64 per cent. of recoveries after 25 operations). But even estimating the recoveries at 25 per cent., which is as much as the average operator under average conditions has reason to hope for, what a saving of the best young lives of the community if perforation were quickly recognized and operation promptly performed.

Stewart[4] reports 8 operations with 2 recoveries. In every case the perforation was in the ileum within three feet of the cæcum. If not found in the ileum and the condition of the peritoneal cavity plainly indicates perforation, the large intestine should be examined, since there are ulcers in the large intestine in 50 per cent. of fatal cases of typhoid fever according to recent examinations.[5] Furthermore, the ileum should be examined for a second perforation which exists according to some writers in one-fifth of the cases of perforation. Stewart believes an accurate diagnosis of perforation can usually be made if the physician will free his mind of the time honored Hippocratic picture of peritonitis, which Osler says is a "rough draft of death," and will watch the patient carefully and will promptly investigate any symptoms that arise. Pain was present in all of his 8 patients. The facial expression was altered in 6. Mental hebetude was present in all, and 3 vomited. None had a chill. In 1 case the temperature fell 3° to normal; in 5 it remained unchanged, in the other 2 it was not taken. The pulse and respirations were invariably accelerated. In 7 cases the respiration was thoracic. Sweating was noted in 6 cases, abdominal distention in 6 cases. Rigidity was present in all cases. This brief list of the common symptoms shows

[1] Taylor, New York Medical Journal, 1902, vol. lxxv. p. 193.
[2] Annals of Surgery, 1903, vol. xxxviii. p. 63.
[3] Ibid., p. 71.
[4] American Journal of the Medical Sciences, 1904. vol. cxxvii. p. 795.
[5] Baer, American Journal of the Medical Sciences, 1904, vol. cxxvii. p. 787.

plainly enough that the diagnosis will be generally made and made within a few hours if the attending physician has the possibility of perforation in mind every time he calls to see a patient with typhoid fever. By such watchfulness the treatment of appendicitis has been brought to its present satisfactory state; the perforation of gastric ulcer has become generally recognized, and no less surely the perforation of typhoid fever will be promptly handled in the years to come.

Elsberg[1] gives a partial report of 15 cases of perforation occurring in typhoid fever patients at Mt. Sinai Hospital, and treated by operation. An early diagnosis of perforation has generally been made, but the signs from which it is made, with the exception of a sudden abdominal pain, and the rarely demonstrable free gas in the peritoneum, are signs not of perforation but of the commencing peritonitis. Perforation is usually followed by an increased pulse and temperature. The condition grows then steadily worse, but only 4 of the 15 patients were in collapse at the time a positive diagnosis was made. Collapse depends a good deal on the amount of escaped intestinal contents. Distention was marked in 6 cases, slight in 8. There was diminution of liver dulness in 14 cases, not always due to free gas, however, as a distended colon or small intestine may crowd the liver backward and so reduce its surface area. In 7 cases the pain and tenderness were most marked on the right side of the abdomen. In 6 cases there were signs of free fluid in the flanks. The presence of free gas can be determined without moving the patient by percussing the abdomen when the head of the bed is raised, and again when the foot is raised. Elsberg very properly points out that a diagnosis from such nice points is much more likely to be made if the physician in charge of the patient carefully examines the abdomen of every typhoid patient from day to day so as to know the location of tenderness, distention of the colon, area of liver dulness etc. As for the operation itself Elsberg irrigates freely after suturing the bowel. With reference to drainage he says, "It is now well known that drainage of the general peritoneal cavity can seldom if ever be accomplished." It will generally suffice to pass a small strip of gauze or a cigarette drain down to the suture line in the intestine or underneath the sutures in the parietal peritoneum, and then to close the greater part of the abdominal incision. Four of the patients were operated upon by Elsberg. Three recovered, the fourth dying of a second perforation.

Haggard[2] finds reports of 295 operations for typhoid perforations with 80 recoveries, giving a mortality of 73 per cent. He classifies them as follows; 89 cases of free perforation, mortality 64 per cent.; 19 cases

[1] Medical Record, 1904, vol. lxvi. p. 47.

[2] Ibid., p. 89.

of localized peritonitis, mortality 53 per cent.; 138 cases of general peritonitis, mortality 79 per cent.

Even from South Africa comes a report of a successful suture of a typhoid perforation by Sanders.[1] The accident was so quickly recognized by the physicians in charge of the case that the operation was performed in less than five hours after the severe attack of colic which seemed to denote the breaking through of the intestinal wall. There was no escape of visible fecal matter, but a commencing peritonitis directed the search to the pin-hole opening. Another ulcer had nearly perforated, so that both were indented into the lumen of the intestine and sutured.

A rather startling proposition to reduce the probability of perforation in typhoid fever by early operation for removal of the appendix is made by Hammond.[2] The ground for this he sees in the fact that if the patient has suffered from previous attacks of appendicitis, the inflammation of the typhoid will set up again that of the appendix, while this in turn by its deposit of fibrin and formation of adhesions will favor perforation of the ileum. He mentions two cases, in one of which he operated after perforation had occurred without saving the patient. There were old adhesions around the appendix which seem to him to have been a factor in the failure of the patient to recover after the operation. In the other case he operated early in the typhoid as the patient gave a history of chronic appendicitis, and suffered a good deal from pain in the right iliac region. This patient recovered from the typhoid fever without perforation. The cases are too few of course for conclusions, but Hammond believes that one should remove the appendix whenever the patient who has had an attack of appendicitis gives early in an attack of typhoid fever symptoms which indicate a reinflammation of the appendix, such as pain and tenderness in the right groin and down the thigh, rigidity of the right rectus, nausea, and vomiting.

Physiology of Large Intestine and Appendix. Macewen's admiration for the functions of a portion of the large intestine and appendix seems like feeble-mindedness to those surgeons who believe that civilization has rendered the upper part of the large intestine useless, or even a positive drag upon the system. Such extreme views were recently expressed by Lane,[3] a surgeon to Guy's Hospital, London. He believes that the constant overloading of the cæcum and large intestine stretches and drags downward the cæcum, transverse colon and sigmoid and renders their proper evacuation well-nigh impossible.

[1] Lancet, 1904, i. p. 1723.
[2] Journal of the American Medical Association, 1904, vol. xlii. p. 998.
[3] Lancet, 1905, ii. p. 1695.

"The harm done directly and indirectly by constipation is infinitely greater and more far reaching than that ascribed to alcohol," can hardly be intended literally. Be that as it may, Lane condemns the cæcum especially, calling it the cesspool of the intestine. His proposal is to do away with it entirely by anastomosing the ileum with the sigmoid. Lane says that "the only objection to this modification in the nature of the drainage of the tract is that if the patient is careless and does not attend to the daily evacuation of the rectum material may occasionally pass backward into the cæcum and hard masses of fecal matter may rest there and perhaps cause irritation. As a rule, these masses may be readily removed by an enema, but if the condition recurs and is troublesome he removes the cæcum and ascending colon up to the flexure. As by this time the patient has gained flesh and strength this operation, which is a simple one, is readily borne without risk or anxiety. The ideal primary operation would be the removal of the large bowel down to the junction with the ileum, but against such a measure there is the very unsatisfactory state of these patients which renders them quite unfit to undergo such a severe operation as the removal of nearly the whole of the large bowel without very grave risk of life. It is extremely important to operate at a sufficiently early date."

Such radical views have not passed unchallenged. Barrs[1] says that autopsies do not support Lane's views as to the grave changes in the condition of the intestine, the result of constipation alone. He believes that surgeons in too many instances exclude themselves far too much from the post-mortem room and the pathological laboratory.

In discussing Lane's paper editorially the *Lancet*[2] says: "We believe, however, that the time will come when physiology, anatomy, and bacteriology will supply us with such certain and detailed knowledge of the function of the great gut that the physician will be able to prescribe a diet and healthy conduct of life that will keep the colon busily occupied in the performance of its normal functions and prevent it from acting as a stagnant pool in the moving stream of the alimentary canal. In medicine, as in all other things, prevention is better than cure."

Rupture of Bowel by Air. Stone[3] reports a most unusual case of rupture of the bowel by compressed air, introduced into the rectum of a young man by some of his companions. The air in the reservoir was held at a pressure of twenty pounds to the square inch. When a tap was turned it all escaped in about a second. The abdomen was much distended, and a considerable quantity of air having a fecal odor was withdrawn by aspiration through a trocar. However, no operation was performed, and the patient died about three hours later, or about five hours after

[1] Lancet, 1905, ii. p. 1888. [2] Ibid., p. 1797. [3] Ibid., 1904, ii. p. 217.

the receipt of the injury. At autopsy there were found two longitudinal rents in the bowel eight inches above the anus. There was a quantity of fecal matter in the peritoneal cavity.

Colitis. Beck,[1] as Director of the State Hospital and the Surgical Division at Karlsruhe, has an excellent opportunity to observe patients suffering with chronic colitis, which he designates the most common affection of the intestine. He advocates exclusion of the colon by an ileosigmoid anastomosis, but only in suitable cases. His rules for treatment of these patients are:

1. The cause of the colitis is first to be ascertained, and the plan of treatment decided accordingly.

2. If the colitis is due to inflammatory processes in the neighborhood of the colon, such primary lesions are first to be overcome and preferably by operative measures.

3. If the colitis is due to carcinoma, tuberculosis, or actinomycosis of the colon, the diseased portion of the bowel is to be removed, or, if this is impossible, enteroanastomosis or colostomy should be performed.

4. A patient suffering from colitis from any other cause should have a thorough course of symptomatic-dietetic treatment.

5. If the colitis fails to yield to such measures, an anastomosis should be established between the ileum and sigmoid. This will usually bring about a cure of the colitis.

Beck reports six operations of this character. Five patients were greatly benefited or entirely cured. The sixth died six days after the operation. The Murphy button used had produced gangrene of the sigmoid and perforation.

In 500 cases of chronic colitis Beck ascertained the cause of the trouble to be:

	Times.
From disease of the appendix	120
From disease of the biliary tract	46
From disease of the stomach	44
From disease of the female pelvic organs	110
From peritoneal tuberculosis	7
From broken-down mesenteric glands	1
From enteroptosis	66
From carcinoma of the large intestine	31
From tuberculosis of the large intestine	8
From actinomycosis of the large intestine	2
From inflammations, etc., not in the immediate vicinity of the colon	65

Pauchet[2] divides cases of colitis into mucomembranous and ulcerative. The former produce constipation, pain, and mucomembranous stools; the latter produce the additional symptoms of bloody or puru-

[1] Archiv klin. Chirurgie, 1904, vol. lxxiv. p. 94

[2] Revue de Chirurgie, 1904, vol. xxx. p 638.

a local point or points of tenderness, cachexia, and perfora-
is, fistula). A case of colitis should be treated *surgically*
nedical means have failed. If the ulcer is limited it should
if more extensive the colon should be put at rest (1) by a
ı, which permits irrigation, but is annoying to the patient;
eosigmoidostomy alone, or (3) with unilateral exclusion of
and colon. Operation is indicated in mucomembranous
e symptoms are severe or if the patient cannot afford the
ıd treatment which is required for a cure. Pauchet reports
ıs upon such persons, with 5 cures, 5 improvements, and 2
ich there was no improvement of symptoms.
ıractised *ileosigmoidostomy* with unilateral exclusion of the
colon in a case of obstinate constipation of twenty-five years'
ıssociated with mucomembranous colitis rebellious to all
atment. The woman was completely cured.

n of the Large Intestine—Mechanical. Volvulus of the
arely mentioned in surgical text-books. Manteuffel pub-
ıograph on this subject in 1899 based on reports of 24 cases.
Faltin[3] has been able to collect reports of 80 cases, no less
hich occurred in the hospital at Helsingfors. It would seem
ection is peculiarly common in Finland. Faltin is unable
her the Finnish cæcum is more apt to possess a true meson
he believes that the diet of the common people—sour bread,
ıotatoes, salt raw fish, etc.—are responsible for some of the
ın diseases of the stomach and intestines. *Cæcal volvulus*
lly in young men. The symptoms are sudden abdominal
ing, and obstipation, meteorism, either oblique or trans-
ncreased peristalsis. There is no marked abdominal ten-
l the patient is able to receive a large rectal injection. The
the symptoms is slow. The vomiting may cease for a time,
ıay become fecal. The obstruction is usually only relative,
vidual attack may be recovered from. The results of opera-
far not been brilliant. The volvulus was untwisted (detor-
cases with 28 recoveries. Resection has been practised 9
3 recoveries.

ıf the Ascending Colon. Cullen[4] reports a stricture of the
olon due to *tuberculosis*. Although intestinal lesions are
ıre than one-half of the autopsies performed upon tubercu-
s, in less than 1 per cent. is there a more or less definite
the bowel. The stricture is usually single and at the ileo-

ımaine Médicale, 1904, p. 343.
ıche Zeitschrift f. Chirurgie, 1904, vol. lxxi. p. 355.
ican Journal of the Medical Sciences, 1904, vol. cxxvii. p. 431.

cæcal valve. Adhesions form between the ileum, cæcum, appendix, and omentum, and possibly loops of small intestine, or the process may

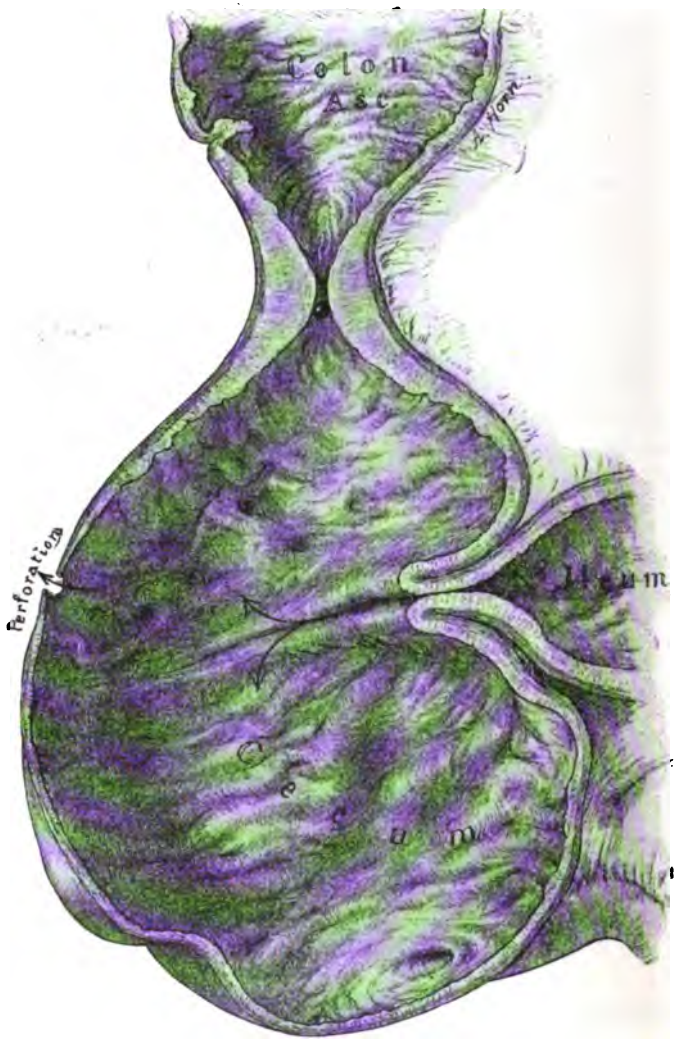
FIG. 21.

Tuberculosis of cæcum, with perforation: *a*, tuberculous lymph glands; the ligated mesoappendix is shown. (CULLEN.)

extend to and involve the anterior abdominal wall. In such a late stage the diagnosis is unmistakable. At an early stage tuberculosis may be mistaken for sarcoma or carcinoma or appendicitis. The characteristic symp-

toms are a tumor of a slow growth in the right iliac fossa without much fever in a patient usually under thirty with a clinical history pointing to previous pulmonary tuberculosis. In certain cases a positive diag-

FIG. 22.



Tuberculous stricture of the ascending colon, with perforation of the cæcum. (CULLEN.)

nosis cannot be made before operation, and perhaps not before pathological examination.

The resection of the diseased intestine should be thorough and palpably enlarged glands should also be removed. The stricture in Cullen's

patient was so tight as to be quite occluded by a small bird-shot. Complete obstruction was caused by it and the cæcum had perforated. The appendix was adherent and was removed under the supposition that it had perforated. On examination its wall was found intact and further search showed the existence of a perforation in the cæcum (Fig. 21). The interior of the prepared specimen is shown in Fig. 22.

Cullen removed the lower third of the ascending colon, the cæcum, and a small portion of the ileum, uniting ileum and colon end-to-end, the first suture being introduced from within the intestinal lumina for two-thirds of their circumference. The patient made a good recovery.

Cullen insists on the importance of examining the right renal pocket when pus or other fluid has collected about the appendix. In this case it contained dark fluid different in appearance from that which had collected in the pelvis, and his attention was therefore drawn to the perforation of the colon.

Those who are interested in the pathology and clinical symptoms of tuberculosis of the intestine will find the subject fully discussed in an article in German by Hofmeister,[1] and one in English by Lartigau.[2]

Malignant Disease of the Colon. Clogg[3] analyses 25 cases of carcinoma of the colon, sigmoid, and upper rectum or rectosigmoid—a portion of the bowel which anatomically and clinically should be classed with the rest of the colon. Such a series of consecutive cases occurring in a single hospital offers a field for valuable study. Two types of growth were recognized. The first type involves three or four inches of bowel, and is soft, friable, extensively ulcerated, and does not materially narrow the lumen of the gut. The second type is of less extent and produces a marked narrowing of the intestinal lumen. The former type predominates in the cæcal region, and is not uncommon in the hepatic. The latter type occurs regularly in the rectosigmoid region and splenic region, but is also found in the hepatic region.

Obstruction of the bowel has been considered an early symptom of carcinoma because patients frequently do not seek medical aid until this symptom is present. Thus in 10 out of the 25 cases under consideration a surgeon was first consulted on account of complete obstruction. Yet in every case careful inquiry elicited the existence of well-marked symptoms antedating the obstruction by two or three months or more. These symptoms were pain, sluggish action of the bowels, deterioration in health, and sufficient loss in flesh to be appreciated by the patient. These symptoms were constant and progressive. Diar-

[1] Beitr. z. klin. Chir., 1896, vol. xvii. p. 577.
[2] Journal of Experimental Medicine, 1901, vol. vi. p. 23.
[3] Practitioner, 1904, vol. xix. p. 525.

rhœa was not noted in any one of the 25 cases, and rectal hemorrhage in only a single case. Clogg warns against visible intestinal peristalsis as a sure sign of intestinal obstruction. He has seen it in cases of pyloric obstruction, of cholelithiasis, and in the crises of locomotor ataxia. Moreover, if obstruction exists and the two sides of the abdomen are equally distended, it is not safe to infer that the obstruction is in the rectosigmoid region. Such an equilateral distention existed in 4 cases of obstruction in the splenic region and in 2 cases of obstruction in the hepatic region of the colon.

Involvement of the lymphatic glands has often been said to occur at a late period in carcinoma of the colon. This is a misleading statement.

Clogg was able to examine lymph glands from 16 patients, and 13 times he found them to be carcinomatous. In some instances the areas of carcinomatous degeneration were small and were only found after prolonged search. This frequency of lymphatic involvement explains the "local" recurrence of the carcinoma which so often follows its wide excision. Numerous cases are on record in which a wide margin of healthy colon has been removed with the tumor and yet in a year or more the tumor has recurred at or near its original site and has again involved the bowel. This is not due to an infiltration of the wall of the colon far beyond the visible tumor, as sometimes happens in gastric carcinoma. Microscopic examination, made in reference to this point, showed invariably that the apparently healthy intestinal wall in the vicinity of the growth did not contain carcinomatous cells. Hence, in operating upon these patients the surgeon should assume that the regional lymph glands are affected and should endeavor to remove them in so far as possible. The location of some of these glands as shown by post-mortem examination in fatal cases is as follows:

1. In the cæcal region the glands form a chain extending for some distance along the ascending colon, and they also lie in the termination of the mesentery. Their removal therefore involves the sacrifice of some inches of ileum and most of the ascending colon. This should be accomplished if non-recurrence is to be hoped for.

2. In the hepatic region the glands (in the 2 cases examined) formed a distinct chain running for some distance along the lower border of the transverse colon. Hence, the removal of the right half of the transverse colon with its mesocolon should form a part of the complete operation for carcinoma of the hepatic region.

3. In the splenic region the glands form a chain extending along the lower border of the transverse colon to the median line. This half of the transverse colon with its meson should be sacrificed in the operation for carcinoma of the splenic region.

4. The glands involved by carcinoma of the sigmoid colon and upper

rectum are spread out in the corresponding mesocolon, whose lymphatics converge in a series of glands situated near the root of the meson. To remove them thoroughly means the sacrifice of practically the whole sigmoid. This necessitates either an artificial anus, with closure of the cut end of the rectum, or sufficient loosening of the peritoneum to permit of anastomosis between the colon high up and the rectum.

Clogg calls attention to a point not generally recognized, and that is the occurrence of suppuration as a complication of colon carcinoma. This was noted in 8 of the 25 cases, in 4 of which the tumor was in the cæcal region. The trouble is likely to be mistaken for appendicitis, from which it can be differentiated by its gradual development and subacute course. The fever is slight with only occasional rises to 101° or 102°. The tumor formed by the abscess is not very tender, and muscular rigidity is absent. The incision made to relieve the suppuration discharges pus with a fecal odor, or pus and feces. If radical operation is not attempted or is found impossible Clogg advises "short-circuiting" the bowel so as to relieve the patient of a permanent fecal fistula. While an artificial anus is bearable in the lower colon, and may be necessary to relieve obstruction, it is most annoying in the cæcum, and for irremovable carcinoma in the cæcal region ileocolostomy ought always to be performed if the patient's strength will permit. If the growth is so low in the rectosigmoid that ileocolostomy is impossible, simple colostomy must be performed. This Clogg defers until symptoms of obstruction manifest themselves, since the difficulties of the operation are not increased by distention of the bowel and the patient is saved the annoyance of an artificial anus as long as possible.

Wallace[1] operated upon 10 patients for *malignant stricture of the large intestine;* hepatic region 3 times, splenic region 5 times, rectosigmoid twice. Six of these patients sought medical advice for the obstruction, although all had previous symptoms. All had previous constipation, 2 constipation alternating with diarrhœa; there was loss of weight in 7 cases; distention and borborygmi in 4 cases; visible peristalsis in only 2 cases.

Pollard[2] reports 7 cases of carcinoma of the colon treated by operation. One patient died suddenly four years afterward with no sign of recurrence of the cancer. The others were living at the time of report, all apparently free from the disease, at periods varying from two months to four years. The tumor was situated in the ascending colon (2 cases), splenic flexure (1 case), descending colon (1 case), and sigmoid flexure (3 cases). Symptoms positively due to the tumor, such as loss of weight,

[1] Transactions of the Medico-Chirurgical Society, Edinburgh, 1904, vol. xxiii. p. 168.

[2] British Medical Journal, 1904, i. p. 175.

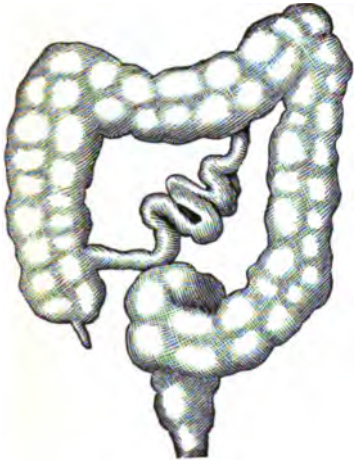
pain, and interference with peristalsis, existed in all the cases from two to eighteen months before operation. A tumor was palpable in 6 cases, and had occasionally been felt in the seventh. The incision employed was usually oblique. In the first operation performed the tumor was isolated and brought outside of the peritoneal cavity. Colectomy was performed two weeks later. In the second case it was necessary to remove the left kidney and a part of the pancreas on account of involvement. The operation with the colectomy was completed at once, Murphy's button being employed for anastomosis. In the succeeding 5 cases the operation was performed substantially as follows: The surgeon first determines whether colectomy is possible, and, if so, how much of the bowel must be removed, and how far the peritoneum must be divided, and bloodvessels ligated, in order to give sufficient mobility for suture of the cut ends of the colon. This field of operation is then isolated from the rest of the abdomen by packing sterilized gauze around it. The growth and the accompanying bowel is next freed by ligation and division of its mesocolon. Great care should be taken to avoid injury to neighboring structures, such as the ureter or renal vessels. The affected colon should be so freed that it can readily be brought out of the abdomen, and surrounded with gauze. The colon is clamped with four Doyen clamps—two on either side of the tumor. The clamps which are placed upon the portions of colon to be anastomosed are two or three inches from the line of section. Those which are placed on the portion of colon to be excised are close to the line of section. The line of section is to be made close to the still attached mesocolon, and should pass obliquely across the bowel so that more bowel is removed on the side opposite the mesocolon.

The interior of the ends of the colon to be sutured should be wiped out with dry gauze and then with gauze or cotton wet with bichloride of mercury 1:1000 before the suture is begun. In this way there will be less risk that the fingers will spread infectious material from the inside of the colon to the outside of the colon and thus to the peritoneal cavity. Pollard considers simple stitching preferable to any mechanical device. The two ends of the bowel are first fixed by a stitch at the mesocolic attachment. A continuous suture is then inserted from within the bowel passing through all the coats. This suture is begun opposite to the mesocolon and is carried past the mesocolon and as nearly around the whole circumference of colon as possible. The remaining one-sixth or more of the circumference is sutured from the peritoneal surface. This first suture is drawn tight enough to control hemorrhage. A second Lembert suture not passing through the mucous membrane is then inserted. The clamps are removed and the gap in the mesocolon is sutured, or if this is impossible the cut edges are sutured

to the posterior peritoneum so as to close any opening in which small intestine might become strangulated. The field of operation is mopped with bichloride gauze and washed with salt solution, and the gauze packing is removed. The sutured colon is returned to the abdominal cavity and the abdominal wound is sutured without drainage unless, on account of oozing or some other complication, this is considered risky.

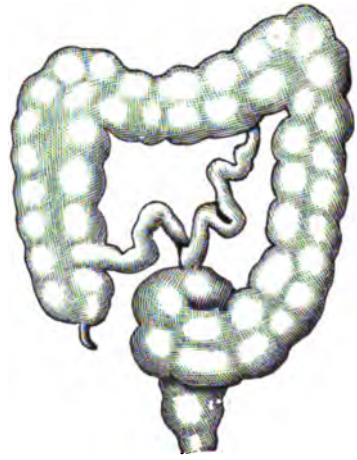
Pollard's technique is given thus at length because its simplicity appeals so to reason and because his uniformly good operative results show how much the abdomen appreciates respectful consideration. Such cleanly, simple technique should be the aim of everyone who enters the peritoneal cavity.

FIG. 23.



Intestinal exclusion, enteroanastomosis. (MOYNIHAN.)

FIG. 24.



Enteroanastomosis with constriction by suture of the part distal to the upper opening. (MOYNIHAN.)

Exclusion of the Intestine. A portion of intestines is said to be excluded when the fecal stream is diverted from it, and it is therefore rendered inactive. Such exclusion may be complete or incomplete. Of the various forms of exclusion theoretically possible, Moynihan[1] selects five which he considers worthy of a place in surgery. The accompanying drawings are here reproduced. These five forms of intestinal exclusion are:

1. Enteroanastomosis, as suggested by Maisonneuve; the "short-circuiting" of English writers (Fig. 23). 2. Enteroanastomosis with constriction by suture of the part distal to the upper opening (Fig. 24). 3. Unilateral exclusion. When the gut is divided completely across

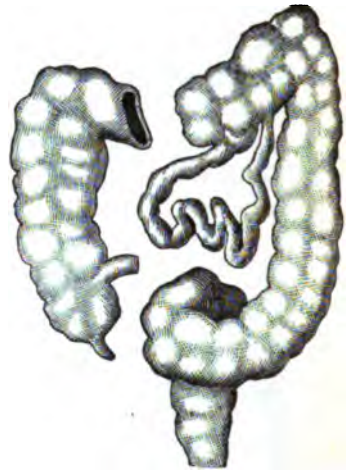
[1] Lancet, 1904, ii. p 1011.

and the proximal end is implanted into the side of the distal, the distal end may be closed or may be left open (Fig. 25). 4. Bilateral exclusion. The bowel is divided at two places and the intestinal

FIG. 25.

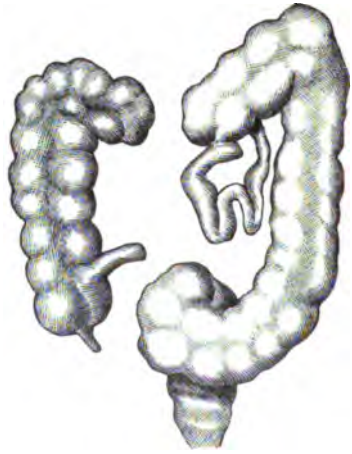
Unilateral exclusion. (MOYNIHAN.)

FIG. 26.



Bilateral exclusion, the distal end of the excluded gut left open. (MOYNIHAN.)

FIG. 27.



Bilateral exclusion, both ends of excluded gut closed; fistula. (MOYNIHAN.)

channel is restored, leaving a segment of the bowel detached. Of this segment one end may be left open and stitched to the skin (Fig. 26) or both ends may be closed when a fistula exists in the bowel lying between them (Fig. 27).

In bilateral exclusion at least one end of the excluded gut should be left open for the escape of intestinal contents. This should usually be the distal end. Experience has shown that if both ends of an excluded portion of intestine are closed the secretion from its own wall may so distend the loop of intestine as to render necessary a second operation for its relief.

Exclusion has been performed for tuberculous or simple ulcers of the intestine which have produced chronic fistulæ and for intestino-vaginal fistula. In this case after bilateral exclusion, the discharge into the vagina soon becomes imperceptible. The operation has also been performed in chronic colitis, and in cases of malignant disease of the intestine too far advanced for removal of the tumors.

THE APPENDIX.

The most important contribution of the year to the literature of the appendix comes in the form of a large book from the pen of Kelly[1] and his assistant Hurdon, and the pencils of four Johns Hopkins artists. The teaching value of a drawing is very great if it is made by one who is an anatomist and pathologist as well as an artist. Brödel has succeeded so well in this field that he has had many followers. One of the chapters on the anatomy of the appendix, of which he is the author as well as part illustrator, calls attention to the interesting way in which the appendix is usually protected from fecal pollution. At its orifice are two folds of mucous membrane named for those who have previously described them, Gerlach and Nanninga. These folds are not true valves, but they act as such and prevent the passage of fecal matter from the cæcum into the appendix, provided *the angle between the two organs is a slight one,* 20 degrees or 30 degrees. If it is greater than this the orifice may be open for the passage of matter in either direction, even if the folds are well marked (Fig. 28).

Within twenty years from the time when Fitz coined the word appendicitis, and declared the appendix to be the origin of the manifold forms of inflammation in its vicinity, the knowledge of this subject has become so complete that American surgeons are thoroughly in accord upon most of the details. There can be no more striking evidence of the progress of modern surgery, and there is none upon which American surgeons can more justly pride themselves. It is fitting that the record of their achievements has been placed in such a permanent and perfect form by one of their own number.

[1] The Vermiform Appendix and its Diseases. Kelly and Hurdon. Philadelphia, 1905.

Physiology of the Appendix and Cæcum and the Causation of Appendicitis. Macewen[1] was enabled to study the interior of the cæcum in a man who was wounded by an explosion. The anterior wall of the cæcum was destroyed, exposing the ileocæcal valve and the appendicular orifice. There was a considerable flow of glairy mucus from the appendix and cæcal surface which did not constantly exude or at least did so to a greater extent shortly after food was introduced into the stomach and to a marked extent just before food began to pass through the ileocæcal valve. On one occasion quite a stream of fluid poured from the

FIG. 28.

The appendicular orifices in connection with a cæcoappendicular angle of 42 degrees. (BRÖDEL.)

appendix just before the chyme began to pass through the ileocæcal valve. When chyme passed through this valve it did so in small quantities at a time, and there were occasional pauses in which the ileocæcal valve seemed to close—probably by a reflex action. This fluid from the cæcum and the appendix was invariably alkaline. This patient, who was very observant, took quite a philosophic interest in his condition and was rather proud that his misfortune could be made of service. It was seen that his will power had no effect upon either the secretion or on the control of the ileocæcal valve; but one day when he was much disturbed

[1] Lancet, 1904, ii. p. 995.

by the reception of "bad news" which could not be kept from him, and after which he said he had indigestion or was "bilious," the secretion in the cæcum was at first very watery and then the surface became drier than at any previous time and apparently the contents of the small intestine were more quickly evacuated and overflowing gave rise to smarting and irritation on the sides of the wound. The chyme was acid, and the cæcal secretion being scanty was not sufficient to neutralize it. Usually the flow from the ileocæcal valve was slow, the material passing into the cæcum in small quantities which sliding over the orifice of the appendix were smeared by the exudation therefrom, as well as mixed with the exudation from the general cæcal cavity.

Macewen was led to the conclusion that the discharge of the contents of the small intestine into the cæcum, acting on the nerves of the mucous membrane of the cæcum and appendix, sets up a reflex action which controls the quantity of the discharge through the ileocæcal valve. Pawlow's experiments have shown that a similar reflex action governs the discharge of acid contents of the stomach through the pylorus.

The appendix has been regarded as a mere diverticulum of the cæcum, and yet its vascular and nervous supply pertains more to that of the small intestine than to that of the colon. Its muscular fibres, both circular and longitudinal, are continuous with those of the cæcum, hence it is easy to see that movements in the cæcum can be excited by primary movements in the appendix. It is known that the mind has an influence on the small intestine through the vagi, sometimes exciting peristalsis and sometimes arresting it. The appendix is subject to the same mental effects.

The *succus entericus* which is exuded by the glands of Lieberkühn has hitherto received scant attention from physiologists. It is of great importance in increasing the activity of the pancreatic ferments. Thus Pawlow found that while pancreatic juice alone took six hours to dissolve fibrin in a thermostat, and had not even attacked white of egg after ten hours, the addition of some succus entericus to the pancreatic juice dissolved the fibrin in from three to ten minutes, and the white of egg in from three to six minutes. The glands of Lieberkühn are far more numerous and better developed in the appendix and cæcum than in the small intestine (Fig. 29). Therefore, the succus entericus which is poured out so abundantly from these parts must be a powerful aid in the complete digestion of the matter which passes the ileocæcal valve.

Micro-organisms find in the cæcum and appendix an alkaline medium favorable for their growth, and in the chyme plenty of nourishment. Degenerated micro-organisms have been repeatedly found in large numbers of the walls of healthy appendices taken from animals.

Macewen suggests that the cells and nuclein of the solitary follicles in the appendix have a controlling action on the organisms, and one of the functions of the appendix may be to maintain cultures of these organisms in a fit state to perform their function on the pabulum poured into the cæcum.

The chyme from the ileocæcal valve is directed toward the orifice of the appendix, and receives there its portion of succus entericus and germs, fitting it for the completion of digestion. The appendix, while having in itself the muscular and nervous mechanism necessary for emptying its contents in any position of the body, is in the majority of instances so placed that the action of gravity favors the escape of the contents into the cæcum. The action of gravity favors the retention

FIG. 29.

Longitudinal section of the glands of Lieberkühn and lymphatic follicles taken from the appendix. (MACEWEN)

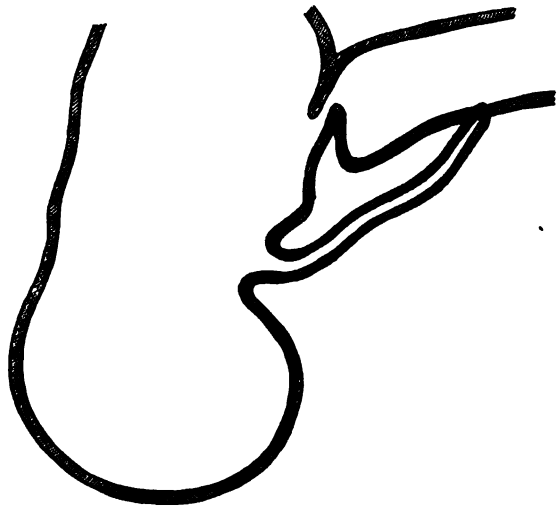
of the chyme into the cæcum until the cæcal digestion is completed, when muscular movements are originated for its expulsion (Fig. 30).

If the cæcum and the appendix perform an important part in the final stages of digestion, it is not to be wondered at that interference with the functions of those parts gives rise to disease. Deaver asserts unhesitatingly that appropriate inquiry will elicit a history of digestive disturbances in almost every case of appendicitis.

In the present state of our knowledge it is difficult or impossible to distinguish between indigestion arising in the stomach or small intestine and that arising in the cæcum. We know, however, that the latter does occur, and if it continues both cæcum and appendix suffer. There will be want of proper exudation of succus entericus in quantity and in quality and lowering of the activity of the solitary lymphatic glands

which will no longer control the germs which swarm in that cavity. The bacillus coli communis, which is the surgeon's terror, serves in its proper place a beneficent purpose in effecting the disintegration of some of the undigested matter, but when uncontrolled by the healthy organs and their exudations is apt to cause ravages in the tissues and to produce toxins which are lethal. If from inhibition of the appendicular and cæcal movements or the want of exudation of the succus entericus, or if the cæcum receives material which the succus entericus cannot digest, stasis occurs in the contents of the cæcum and constipation, which is so often a feature of the appendicitis, ensues. At a later stage fermentative disintegration of the fecal contents with absorption of toxins and damage to the wall of the parts are also apt to ensue. These are followed by diarrhœa which is sometimes curative.

FIG. 30.



Scheme of cæcum, ileocæcal valve, and appendix in section. (MACEWEN.)

Involution of the Appendix. Morris[1] claims that the appendix undergoes a normal involution in middle life, but sometimes much earlier. He supports this claim both by citing cases and by microscopic examinations. One appendix which he removed from a patient who had for many months mild symptoms and a very slight local tenderness "presented no external evidence of infection changes. On longitudinal section it was observed that nearly all of the distal half of the appendix had undergone a normal involution process, with obliteration of the lumen, and replacement of the lymphoid and mucous layers by connective tissue. The part that showed involution change had a slightly

[1] American Journal of Obstetrics, etc., 1902, vol. xlvi. No. 4.

lesser diameter than the part that still possessed a lumen. Microscopically the peritoneal covering was normal. The two muscular coats were undergoing a degeneration process. The lymphoid and mucous layers had entirely disappeared, and were replaced by connective tissue." The condition is associated with symptoms of intestinal fermentation which may last some years and disappear when the involution is complete. The treatment is symptomatic only, unless the patient prefers to have his appendix removed rather than to continue medical treatment for some years.

Experimental Appendicitis. Van Zwalenburg[1] has been able to produce appendicitis at will in dogs by ligating the appendix and then producing beyond the ligature an intra-appendicular pressure equal to the arterial pressure. Simple infection does not account for the severity of the onset in human appendicitis, and this experimenter therefore believes that a process takes place in man similar to that which followed ligation and distention in the dog. This would account for the pain, and if kept up for a few hours would account for the rapid gangrene, since there are always present in the lumen of the appendix germs to multiply in the tissues whenever their vitality is lowered by the distention.

Appendicitis due to Pneumococci. Shaw and French[2] report a fatal case of appendicular abscess occurring in a girl aged eighteen years due to the pneumococcus, an almost pure culture of which was obtained from the pus. The autopsy showed the lungs, pleuræ, pericardium, kidneys, liver, spleen, pancreas, suprarenals, pelvic viscera, brain, and meninges to be perfectly normal. There was about a pint of turbid serum in the peritoneal cavity with coagulated lymph, thickest about the cæcum. The appendix was much inflamed and buried in lymph and pus, and there was pus in the lumen, but no visible perforation was present. The case was therefore recorded as one of primary pneumococcal appendicitis.

Appendicitis among the Arabs. It is stated by Brunswic-Le-Bihan[3] that Arabs are not free from appendicitis, that the Arabs of the plains who live on vegetables do not suffer with it, but it attacks Arabs of the cities who eat meat. He operated upon 12 Arabs at a hospital in Tunis and in each case the suppuration was retrocæcal. To explain this unusual fact he examined 36 Arab cadavers and found the appendix retrocæcal in 26 of them, and in 21 of these cases there was no meson, but the appendix was smoothly covered by the peritoneum of the iliac

[1] Journal of the American Medical Association, 1904, vol. xlii. p. 820.
[2] British Medical Journal, 1904, ii. p. 18.
[3] La Semaine Médicale, 1904, p. 343.

fossa; so that its posterior surface was in intimate contact with the subperitoneal tissues.

Diagnosis of Appendicitis. In making a diagnosis of acute appendicitis Bell[1] says that four points should be borne in mind. 1. If the patient is a woman the possibility of right-sided tubal or ovarian trouble should be excluded. 2. Cutaneous hyperæsthesia of the eleventh dorsal nerve is a valuable sign if present, and may precede rigidity, but in its absence appendicitis is not to be ruled out. 3. When perforation has taken place palpation under an anæsthetic will serve to locate it; for observation has shown it to be a general law that in rigidity of the abdomen consequent upon some acute lesion the site of the lesion is situated beneath that area of muscular rigidity which is the latest to relax as anæsthesia progresses. 4. Changes in the pulse and temperature must be interpreted in conjunction with other signs. Thus a low temperature, slow pulse, and disappearance of pain are often indicative of gangrenous processes, septic peritonitis, and the beginning of the end —not of convalescence.

The following points are helpful in deciding upon the necessity of operation in chronic appendicitis: 1. If the patient suffers from slow chronic dilatation of the cæcum with inflammation of the same, and there are at intervals definite attacks of colic located in the appendicular region or elsewhere, or attacks of an obscure nature, accompanied or not by increased temperature and vomiting with more or less abdominal pain, it is probable that the patient will not recover until the appendix is removed. 2. If such a patient is not relieved of symptoms by aperients, intestinal antiseptics, lavage, and selected diet, and above all if abdominal massage increases instead of relieves symptoms, there is some irritant cause of the symptoms, probably an inflamed appendix. 3. Hyperæsthesia along the outer edge of the right rectus muscle, not in the skin, but in the abdominal wall, is a common sign of chronic appendicitis. So is the presence of a reflex pain at the umbilicus or in the hypogastrium, which is not increased by pressure at the spot to which the pain is referred, but is distinctly increased by pressure upon the appendix, not perhaps tender in itself.

Russell[2] emphasizes the importance of distinguishing superficial from deep pain in making the diagnosis of appendicitis. The pain felt by the patient is often referred to some other region than the appendix, and if there is surface pain in such region the observer is still more likely to make a wrong diagnosis. Deep tenderness is a far more reliable sign, and this can usually be elicited by careful palpation, even when the muscles are rigid. In one case mentioned this deep pain could

[1] Lancet, 1904, i. p. 1556. [2] Ibid., p. 787.

only be brought out by rectal examination owing to the situation of the appendix.

Russell's conclusions are of interest as representing the attitude of one whom a surgeon may perhaps designate as an enlightened conservative without giving offence:

1. Certain appendices are so formed anatomically that they of necessity give rise to trouble. 2. Interference with the drainage of the appendix is an important factor in determining inflammation. 3. The occurrence of appendicular colic may be taken as a warning that dangerous anatomical conditions exist in connection with the appendix. 4. In all abdominal cases detailed palpation should be carefully and patiently carried out. 5. Too much emphasis must not be put on the site of the pain or on superficial tenderness. Palpation should be directed toward ascertaining the actual condition of the diseased part. 6. Statistics show that from 90 to 95 per cent. of cases recover without operation and the chances against recurrence are as 3 to 1 or thereby. Therefore routine removal cannot be accepted as necessary. 7. Operate at once in any case with a history of previous attacks, also in all cases commencing with a rigor. 8. The chief difficulty lies in the early recognition of the cases in which the appendix will necrose or perforate rapidly. In this connection suspect cases which show constitutional disturbance with little inflammatory reaction round the cæcum but with marked tenderness on deep palpation and an ordinary degree of leukocytosis. 9. In cases which do not call for immediate operation pain may be relieved by hot or cold local applications and by a cautious and sparing use of opium or morphine or of belladonna. Lavage may give good results. 10. Medical treatment should not be relied on for more than from twenty-four to forty-eight hours if severe pain continues or an acute tenderness on deep palpation still remains. 11. Later in the disease a continuance of the local and general symptoms along with a high leukocyte count indicates the presence of pus and the necessity for operative interference.

Value of Leukocyte Counts in Appendicitis. French[1] contributes a paper on the leukocyte count in appendicitis based on a study of 83 consecutive cases. Early investigators of this symptom laid down the absolute rule that pus is always present if the leukocyte count exceeds 20,000. Yet it has been found that patients sometimes recover without operation after having such leukocytosis, and presumably pus was not present. Later the importance of a *rising* leukocyte count was emphasized. While this is certainly a good sign of pus, yet it must not be overlooked that pus may be present with a stationary or even a falling count.

[1] Medico-chirurgical Transactions, 1904, vol. lxxxvii. p. 467.

In order to obtain the greatest good from the results of his study, French divides the cases into four groups:

GROUP I. (21 cases). The symptoms in Group I. were acute or gradual onset, vomiting perhaps in first twenty-four hours, seldom thereafter; usually constipation; pain, tenderness, and possibly rigidity, all limited to the right iliac fossa, but *without tumor*. These patients all convalesced without operation. In 3 cases operation was performed during convalescence. Adhesions were found about the appendix, but no pus or gangrene. It is fair to assume that no pus existed in any of these cases, all of which terminated in recovery. In most of these cases there was little or no leukocytosis. In two-thirds of them the count did not exceed 15,000, but in 3 cases it exceeded 20,000, and in 1 case reached 31,000, without the appearance of any other symptom indicative of pus as has been stated.

GROUP II. (23 cases). In this group the clinical signs were local, but in every case a definite tumor could be felt. Operation was discussed but not considered necessary, and all of these patients convalesced without operation. In 2 cases operation was performed during convalescence and there were adhesions but no pus.

In this group the leukocytosis exceeded 15,000 in one-half of the cases and 20,000 in more than one-third. The highest count was 31,000. All of these patients recovered.

GROUP III. (26 cases). In this group the clinical signs were local, but pus was proved to be present, either by operation or by the rupture of an abscess into the bowel. In three-fourths of these cases the leukocytosis exceeded 15,000, and in two-thirds the count was at one time above 20,000. Yet in only a quarter of these cases was the count clearly above the maximum of the other groups. In these 6 cases it reached points between 34,000 and 56,750. But the value of a rising count is strikingly shown by a number of the cases in this group.

GROUP IV. (6 cases). The clinical signs in the cases of this group were not confined to the right iliac fossa, but were general all over the abdomen. All of the patients were operated upon. Three died; 3 recovered. In one-half of these cases the leukocyte count was less than 11,000. Two of these patients died. In the remaining 3 cases the count was at some period over 30,000. Two recovered. It is generally recognized that the leukocyte count is of little value in these cases complicated by acute general peritonitis.

"Leukocytosis is thought to depend on chemotaxis; perhaps in a mild case there is a small dose of toxin; the chemotactic effect on the leukocytes is slight and they do not increase. In a severe case there may be a large dose of toxin, the chemotactic effect may be greater, and the leukocytes increase. The dose of toxin may be great enough even

with non-purulent inflammation of the appendix to cause a leukocytosis. Finally, it seems that a very virulent toxin, as in a bad case of acute appendicitis, may prevent the leukocytes from increasing at all. Perhaps the number of leukocytes may thus afford a measure of the virulence of the attack, or of the lack of reacting power in the patient; but this is theoretical.

"As a diagnostic sign of acute peritonitis the leukocytes are not to be relied upon. In this respect they may be compared to the temperature, which may be up or may be down or may be normal. In diagnosing general peritonitis far more stress must be laid upon the pulse rate, the persistent sickness, the abdominal rigidity, and immobility, and the facies Hippocratica, than upon either the leukocytes or the temperature."

The remaining cases in this series were of such unusual character that they were excluded by French from the four definite groups.

These conclusions are in accord with those reached by Cazin and Gros,[1] who made a systematic count in 17 mild cases of appendicitis ending in resolution. In 6 cases the maximum count was not above 15,000; in 8 cases it was between 15,000 and 20,000; while in three cases it reached some figure between 20,000 and 23,000. In mild cases the count never remains at such high figures, but invariably drops on the following day, often nearly one-half. Their conclusion is that leukocytosis at the commencement of an attack of appendicitis does not indicate the character of its termination, notwithstanding a high temperature or severe local pain, even when the increase in the number of leukocytes is *momentarily* as high as 20,000 or 25,000. But when the number of leukocytes is *permanently* increased it clearly indicates suppuration, whatever the other symptoms may be.

Appendicitis in Children. McCosh[2] says that the frequency of appendicitis in childhood is not sufficiently appreciated. He reports the ages of 1000 patients operated upon by himself, showing that 5 per cent. of them were ten years or under, and only 3.5 per cent. were over fifty years of age. The diagnosis in the child is more difficult than in the adult. The infant, and even the child, cannot localize pain or tenderness in the abdomen. It screams and contracts its muscles whenever any part of the abdomen is touched. If the surgeon succeeds in diverting its attention he may gain some information as to the relative sensitiveness of different parts of the abdomen, and the location of muscular contraction. Vomiting is the most persistent symptom in a child, even when no food is given. If it continues without obvious reason and there

[1] La Semaine Médicale, 1903, p. 141.

[2] Journal of the American Medical Association, 1904, vol. xliii. p. 853.

is abdominal pain, and no movement of the bowels, the disease is probably appendicitis. A rapid pulse and high temperature are of more value in determining the severity of the process than in making a diagnosis, since they are produced in childhood by so many causes. The most difficult differential diagnosis lies between appendicitis, diaphragmatic pleurisy, bronchopneumonia, and gastroenteritis. Persistence of vomiting for twenty-four hours with constipation favors appendicitis. High fever suggests gastroenteritis. The development of abnormal chest sounds will, of course, determine the presence of pleurisy or pneumonia, but in the absence of these signs it is sometimes impossible to make a certain diagnosis and one is sometimes compelled to wait a few hours before giving a fina[1] decision, if he would avoid the unpleasant experience of opening the abdomen of a child suffering from pneumonia.

Bennett[1] recognizes that appendicitis in the young often gives rise to symptoms which may mislead. He cites the case of a boy aged fifteen years who, when first seen, had a "flushed face with dark lines under the eyes, a temperature of 101°, a certain amount of tenderness over the right side of the abdomen low down, but no distention worth mentioning, and no swelling or thickening of any kind was perceptible." By the next day the temperature had dropped to 97°, the pain was gone, the rigidity was very slight, and still no swelling of any sort could be found. The house surgeon considered the boy better, but Bennett recognized that his more comfortable state was due to the advancing sepsis which had benumbed his faculties. He operated; opened a foul abscess which contained the perforated appendix, and saved the boy. It is a good thing to recognize the fact if a child is dying of septic poisoning, but far better to remove the cause of the poison before the disease has progressed so far.

Brannan[2] confirms the difficulty of diagnosis in children. In testing the abdomen for tenderness more reliance can be placed upon the action of the child as evidence of pain than upon his statements.

Treatment by Delay. Jonnesco[3] advocates delay, and no wonder, considering the results of his operations. He lost 44 per cent. of 25 patients upon whom he operated promptly for acute appendicitis, and 14 per cent. of 21 patients whom he treated by internal remedies for a considerable time before operating. He concludes that every patient with appendicitis should first be treated with internal remedies. Fortunately, neither this sentiment nor these statistics are fair representatives of the best German practice.

The mortality after operations for appendicitis has been often spoken of; but for the sake of comparison it may be stated that in a recent num-

[1] Lancet, 1905, i. p. 1. [2] New York Medical Record, 1904, vol. lxv. p. 685.
[3] Arch. klin. Chir., 1904, vol. lxxiii. p. 302.

ber of the *Journal of the American Medical Association*[1] several American surgeons reported large series of acute cases with an operative mortality of 5 per cent. or less.

Syms[2] begs the physicians who have charge of patients suffering with appendicitis not to fritter away the patient's chances of recovery by delay. "When one comes to a patient who can evidently withstand the operation, but in whom the chances of recovery seem to be but the slightest, one is confronted with perhaps the most difficult question which presents itself in surgery; that is to say, whether to operate or not. But from the patient's point of view, the slight chance of recovery by operation is the only chance he has; and it certainly seems that the question becomes a moral one, and that the patient is entitled to this one chance, and that the surgeon should not shirk the responsibility. But we always look with longing and regret to those precious hours which have been lost by delay, and to that period that has existed in every patient's case when he might have been operated upon with no fear of a fatal result. . . . At the Lebanon Hospital we are constantly admitting patients who are in a precarious condition, owing to the fact that their physicians have kept them from operation day after day, apparently not recognizing the gravity of the case."

Prenatal Appendicitis (?). Examination of the appendix in the newborn as well as in adults who have never complained of symptoms due to inflammation in the cæcal region, shows a great variation in its position, in its relation to the cæcum, and in the extent to which it is covered with peritoneum. These facts are well known. Such a book as Huntington's *Comparative Anatomy of the Peritoneum and Abdominal Cavity*[3] illustrates profusely and describes a dozen ways in which the appendix can develop so that it shall not have a complete mesoappendix. Yet when a surgeon finds an appendix more or less bound down by peritoneum he is apt to forget that such conditions may be developmental. The writer recently removed the appendix from a young man who gave a very indefinite history of pain in the right side, but no acute attacks of inflammation. The appendix was about six inches long, extended outward and slightly upward for one-half of its length, and then bent sharply and reached back to the starting point, so that its tip and stump were close together and the whole appendix formed a slim U. It was completely covered by the posterior layer of peritoneum so that there was no mesoappendix whatever. The bloodvessels entered the appendix from its lower and posterior aspects. The peritoneum which covered the appendix was of the same appearance and texture as the other normal

[1] Journal of the American Medical Association, 1904, vol. xliii. No. 13.
[2] Annals of Surgery, 1904, vol. xl. p. 727.
[3] Philadelphia, 1903.

peritoneum exposed by the operation. This was in my judgment a marked instance of developmental "adhesions"—if one must use a word which to the surgeon signifies previous inflammation. When, therefore, Jackson[1] presents a case of "prenatal appendicitis" we are justified in asking for some other ground for the diagnosis than the "adhesions" between the appendix and cæcum. It is true that the appendix was congested, but as the child died when two days old of a large dose of bichloride of mercury, the congestion may well have been caused by the metallic poison. The accompanying illustration (Fig. 31) is from a photograph of the appendix, cæcum, and ileum.

An Inverted Appendix. The appendix has been found inverted into the cæcal cavity, and when so inverted it may give rise to severe symptoms of chronic appendicitis. This unusual case is reported by Brewer.[2] The patient was a woman aged twenty-two years, operated upon during

FIG. 31.

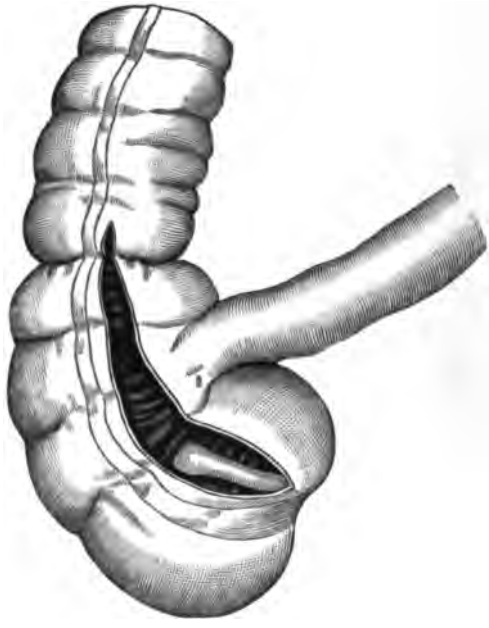
an acute attack of appendicitis. The appendix was not found. There was plastic peritonitis but no abscess. The patient recovered from the operation but suffered so much from pain, indigestion, etc., that the abdomen was reopened some weeks later, and the cæcum more thoroughly freed and examined. No appendix was present external to it, but a mass could be felt within its lumen. The cæcum was incised, and the condition of things represented in Fig. 32 was discovered—viz., the appendix inverted for nearly the whole of its length, and presenting signs of old and recent inflammation. Brewer is unable to say whether the condition was congenital, representing an error of development, or acquired in the nature of an intussusception of the appendix.

Complications of Appendicitis. Though the possibility of *prerectal abscess* as a complication of appendicitis has often been referred to,

[1] American Journal of the Medical Sciences, 1904, vol. cxxvii. p. 710.
[2] American Medicine, 1905, vol. ix. p. 67.

and although rectal examination has repeatedly been urged as a routine procedure before deciding on the treatment of appendicitis, the advice is often neglected. In consequence an abscess may pass unnoticed to give trouble at the time or weeks later. Owen[1] mentions an instance of the latter type. A man aged forty-five years was seized with an attack of abdominal pain chiefly centred in the hypogastric region, and so severe that he made a diagnosis of appendicitis. He consulted a physician, who finding his right iliac region free from tenderness, assured him that he was suffering from the after-effects of influenza. Hot fomentations were applied and the patient's condition improved; but for three months he suffered from more or less pain and fulness at the neck of

FIG. 32.



the bladder and from difficulty in defecation. At last a rectal examination was made and a mass easily detected in front of the rectum above the prostate gland. The patient was referred to Owen, who made a median abdominal incision and opened the abscess cavity, in the right side of which was the tip of an inflamed appendix. The cavity was drained through the abdominal wound, and the patient made a slow but complete recovery.

Appendix and Ovary. Craig[2] denies that there is a connection anatomically and pathologically between the appendix and ovary. The use

[1] Medical Press and Circular, 1904, vol. i. p. 165.

[2] Journal of the American Medical Association, 1904, vol. xliii. p. 1438.

of the term appendiculo-ovarian ligament is therefore an unfortunate one, but like many others having once found its way into medical literature it probably will not be given up. Clado suggested the name which was emphasized later by Durand, under the mistaken notion that the right suspensory ligament of the ovary "takes its origin" from the meso-appendix, or the peritoneum about the cæcum or lower end of the ileum. This is an anatomical error, since the ligament represents the path followed by the ovary in its descent from the Wolffian body; so that if it can be said to arise anywhere, it is from the phrenic ligament of the kidney. If it seems to originate in the peritoneal folds about the appendix, it is only because the structures happen to lie together; and any lymphatic connection between the appendix and right ovary is merely an anastomosis, as the structures are of totally different origin.

This view is also in accord with the clinical observations. Only a few cases have been observed in which inflammation has actually proceeded from the appendix to the ovary or in the reverse direction; while many men have been misled in their diagnosis by the presence of a tenderness starting high up in the iliac region and extending down into the pelvis which they have attributed to appendicitis. The swelling of the extrapelvic portion of the suspensory ligament may even be felt before operation if careful palpation is made. Craig mentions 5 cases in which the extrapelvic portion of the ligament was inflamed in connection with ovarian disease, and in none of which was the appendix involved except as the dragging of the swollen ligament sometimes produced a curvature of the organ. The treatment followed was the excision of a V-shaped piece of the ligament, besides the appropriate treatment of the diseased ovary. The appendix when normal was not interfered with.

The permanent recovery of these patients showed that the appendix was in no way at fault.

Anatomically the left suspensory ligament would seem just as subject to inflammation as the right, but as far as known no instance of this has yet been reported.

The most important complication of appendicitis—peritonitis—is discussed under the heading "Inflammation of the Peritoneal Cavity."

Tumors of the Appendix. Kelly[1] states that there are 49 cases of carcinoma of the appendix on record, including 2 cases of endothelioma and 5 cases of primary sarcoma. To these he adds the records of 3 cases of carcinoma and 1 of sarcoma, making 58 cases of malignant disease of this organ. Some of these were discovered after removal of the organ and some at autopsy. Fig. 33 gives a good idea of the appear-

[1] Kelly and Hurdon, Vermiform Appendix, 1905.

FIG. 33.

McBurney's case of primary carcinoma of the tip of the appendix. There is a slight constriction proximal to the growth and the mucosa is somewhat swollen and hyperæmic. (Museum, N. Y., No. 2020.)

FIG. 34

Colloid carcinoma of the appendix, discovered at autopsy. (From A Elting, Albany, N Y.)

ances in the former class of cases, while Fig. 34 shows an advanced case of colloid carcinoma found at autopsy. The symptoms of malignant disease of the appendix are those of chronic appendicitis in the early stages. Perforation may result, or there may be no symptoms till the growth of metastases gives the usual symptoms due to them.

THE PERITONEAL CAVITY.

Penetrating Wounds. Harris[1] reports 16 operations for penetrating wounds of the abdomen with 3 deaths. One patient died from hemorrhage so profuse that it was not controlled in time to save life. Another patient who died had complicating injuries of both lungs and the spinal cord; and the third had eight intestinal perforations in the small intestine, transverse and sigmoid colon. Two patients were operated upon, but no hemorrhage or intestinal perforation was found. They both recovered. There were then three unsuccessful operations upon patients who would certainly have died without operation; two unnecessary but successful operations upon patients who would have recovered without operation; and eleven successful operations upon patients most of whom would certainly have died without operation. Could there be a stronger answer to those who counsel delay in these cases? Others advise operation in every penetrating wound due to a bullet, and delay in stab wounds. The fallacy of this advice is also shown by these cases, for the 2 in which no intestinal organs were injured were both cases of gunshot wounds, while there were six instances of stab wounds and wounds due to flying glass, and in 5 of these cases the intestine was wounded and in the other an omental artery was severed and was still bleeding at operation. But to obtain such good results it is necessary to operate early. In all but one of these cases operation was performed within three hours of the injury. Harris emphasizes these points:

1. In penetrating wounds of the abdomen there are absolutely no known symptoms which indicate injury to any of the viscera except hæmatemesis, hæmaturia, or the occasional passage of blood per rectum.

2. Except those relating to general shock, all symptoms following such wounds indicate either internal hemorrhage or peritonitis.

3. To wait for symptoms of perforation of the intestine means to wait until peritonitis has developed; therefore

4. Every bullet or stab wound which penetrates the abdominal cavity should be operated on at the earliest possible moment in order to anticipate the advent of peritonitis.

5. No time should be wasted in attempting to demonstrate the presence or absence of intestinal perforation by such means as the rectal

[1] Annals of Surgery, 1904, vol. xxxix. p. 356.

insufflation by gases or vapors, or the analysis of re-collected intraperitoneally injected air or liquids.

6. It is essential to systematically examine the entire gastrointestinal canal in all cases regardless of the point of entrance of the wounding body.

7. Whenever the alimentary canal has been perforated, suitable drains (the author prefers the so-called cigarette drains) should be placed either through the operative incisions or counterincisions as may appear best suited to the individual case.

Long[1] holds similar views. His advice is to consider all abdominal wounds as penetrating till the contrary is proved by exploration; and to consider all penetrating wounds as having injured the viscera until careful inspection during a laparotomy has shown them uninjured.

Wounds of the Diaphragm. Wounds of the diaphragm frequently lead to hernia. Kaggs[2] was able to find recorded no less than 63 cases in which a portion of the stomach was involved in a *diaphragmatic hernia*, which he divides into congenital (24 cases, 15 of them discovered in persons between six weeks and sixty years of age); traumatic (21 cases); and acquired (12 cases, in 8 of which the protrusion of the stomach was determined by the œsophageal opening). The traumatic cases have perhaps the greatest surgical interest. Seven were due to stab or bullet wounds, 8 to crushes and 6 to falls. The aperture in the diaphragm was more frequently in the tendinous than in the muscular portions of the diaphragm, and rarely near the muscular attachments to the ribs. The diaphragmatic wound was never fatal *per se*, and if the patient survived other injuries, the rent became a well-defined aperture, with smooth edges, and often there were adhesions in its neighborhood between adjacent parts. About one-fourth of the patients referred to in this paper died from obstruction or torsion of the stomach, 1 from perforation of the organ, 1 from tetany, and 3 with symptoms suggesting pressure upon the heart.

Non-perforating Injury. It is interesting to note that the abdominal muscles may be ruptured without serious injury of the skin or abdominal viscera. Eisendrath[3] reports such a case—certainly an unusual one, as he has been unable to find any similar report of an injury which did not prove fatal. His patient, aged fifty years, was caught between two street cars passing on tracks close together. Three hours later the patient was suffering from shock and presented a resonant tumor above the right iliac crest, which was reducible with a gurgle. The clavicle and two ribs were broken. When the skin was divided it was seen that

[1] American Medicine, 1904, vol. viii. p. 645.
[2] Lancet, 1904, ii. p. 358.
[3] Annals of Surgery, 1904, vol. xxxix. p. 979.

from the quadratus lumborum posteriorly to the middle of Poupart's ligament in front, every structure which is normally attached to the crest of the ilium and the outer half of Poupart's ligament, had been torn from its attachments. In the iliac fossa were many loose pieces of omentum, and the ascending colon was contused and dilated, but there were no other visceral injuries. The muscles were sewed to the gluteal fascia with fourteen mattress sutures of kangaroo tendon. A left-sided pneumothorax and a left-sided thrombophlebitis of the femoral vein delayed recovery somewhat. The scar of the extensive skin incision is shown in Fig. 35.

FIG. 35.

Cicatrix of incision made to expose subcutaneous laceration of abdominal muscles (EISENDRATH.)

Rupture of Abdominal Cicatrix. At the last French Congress of Surgery Reynier[1] reported 2 cases of rupture of the abdominal scar and eventration following removal of the sutures in eight or ten days after laparotomy. In 1 case he replaced the intestine and the patient died; in the other he covered the intestine with a compress smeared with vaselin and applied a rubber bandage. In this manner the protrusion was gradually overcome and the patient recovered. An operation for the hernia will, however, be necessary.

[1] Revue de Chir., 1904, vol. xxx. p. 635.

Pozzi reported 6 such cases, all treated by immediate replacing of the intestine and suture with drainage. There was 1 death.

Roux experienced this accident three weeks after operation. The intestine was replaced after twelve hours and the patient recovered. He objects to the use of a continuous suture or to the use of soluble sutures for closing abdominal wounds.

Bousquet has twice replaced intestines protruding from a reopened abdominal wound. Once the intestine was in the bed beyond the bandage. Both patients recovered.

Gourdet thinks the accident due to a faulty suture. He has never experienced it since he abandoned a through-and-through suture for one in three layers. He does not believe the immediate replacing of the intestine is absolutely without risk.

A New Abdominal Incision. Stimson[1] calls attention to an incision for opening the abdomen which minimizes the scar and tends to prevent ventral hernia, and which, though it has been employed and described by a few surgeons for some years, has not become generally known. The skin incision is a shallow curve concave upward extending across the median line 3 or 4 cm. (1 to 1.5 inches) above the symphysis pubis. The length is three or more inches. The aponeuroses of the external and internal oblique muscles are similarly divided, but not beyond the outer borders of the recti muscles. The central portion of this aponeurotic flap is freed with knife and fingers. It is then drawn sharply upward and the abdomen is opened by a longitudinal incision in the median line. The abdominal wall is sutured in three layers—viz., peritoneum, aponeurotic flap, and skin. The sutures of the aponeurosis are of chromic gut. Stimson leaves rubber-tissue drains under the flap for two days. The scars have been firm and relatively inconspicuous. In one case he reopened the abdomen after a few months and found that the aponeurotic flap was firmly united along the incision and also to tissue between the recti muscles. In no case has he seen any hernia following the incision.

To Prevent Postoperative Vomiting. White[2] has found *gastric lavage* an excellent preventive of postoperative vomiting. It is indicated in cases in which there has been insufficient time to properly prepare the patient; in cases in which the anæsthesia is continued for an hour or longer; in cases of short anæsthesia if the patient has suffered previous to operation from nausea and vomiting or chronic gastritis. It is contraindicated in operations upon the stomach and in young children. The tube should be introduced while the patient is still fully under the anæsthetic.

[1] Annals of Surgery, 1904, vol. xl. p. 178.

[2] Ibid., p. 194.

Increase in Resisting Power of Peritoneum. Recognizing the impossibility of protecting the peritoneal cavity from all infective germs in operations in which the stomach or intestine is opened, Mikulicz has been experimenting to learn if there is any way of increasing the power of the peritoneum to dispose of such germs as are left within it in spite of the best operative technique. If this end can be accomplished, not only will the lives of some patients be saved, but others will avoid an unusually tedious convalescence. There have been many attempts to reach this end by producing an artificial hyperleukocytosis. More than ten years ago Loewy and Richter injected spermin and other albuminous substances into animals for this purpose. A hypoleukocytosis was first produced, but this was quickly followed by a hyperleukocytosis, and the blood of the animal was shown to have a greater bactericidal power in this later stage than at any other time. These experiments, however, have had no practical application to man.

In 1894 Issaeff accomplished a similar result with normal saline solution, bouillon, tuberculin, and nucleic acid, increasing the peritoneal resistance for cultures of cholera bacilli thirteen to seventeenfold in some instances. The phagocytosis was marked in two hours and in three hours no more microbes could be found in the exudate.

Salieri[1] in 1902 was able to increase the resisting power of the peritoneum sevenfold against coli bacilli sevenfold by the injection into the peritoneal cavity of small amounts of saline solution.

These experiments were made upon guinea-pigs, but the method was also employed three times upon man in doses of 30 to 60 c.c.

Recently, Miyake has made numerous experiments along the same line and has demonstrated that the peritoneal injection of nucleic acid, and even the subcutaneous injection will produce a marked hyperleukocytosis whose maximum is reached in about eight hours. He employed a 0.5 per cent. solution for the subcutaneous injection. Experiments showed that a guinea-pig thus treated had a peritoneal resistance sixteen to twenty times the normal against coli bacilli.

Encouraged by these results Mikulicz has employed similar injections administered to 34 patients. The 0.5 per cent. solution of nucleic acid was at first employed, and then stronger solutions. It was not found safe to increase the strength above 2 per cent. on account of nausea and vomiting. Fifty c.c. were injected subcutaneously beneath the breast. The injections were made from six to eighteen hours before operation. The injections produced a leukocytosis varying from 9600 to 25,800. It was not always possible to say whether the hyperleukocytosis had reached its highest point previous to operation or not. Few

[1] Arch. klin. Chir., 1904, vol. lxxiii. p. 347.

unpleasant symptoms were noted as a result of the injections. In one case only was there a chill; in two cases there was fever over 39° C. (102° F.).

Mikulicz says that it is yet too soon to judge of the exact worth of these injections in the human subject. One has no means of knowing what amount of infectious material the peritoneum has to contend with after an operation upon the alimentary canal. Experiments have shown that the subcutaneous injection of nucleic acid in animals produces hyperleukocytosis and increases their peritoneal resistance against infectious germs. In man it causes a hyperleukocytosis, and it is a fair inference that the peritoneal resistance is also increased. In his own practice Mikulicz always employs saline irrigation of the abdominal cavity after operations upon the alimentary canal, washing in and out with large quantities through two tubes, and leaving considerable fluid when closing the abdomen. This practice was not omitted in those cases in which the nucleic acid was injected. Both of these methods are supported by the results of experiments upon animals. The saline irrigation has already the sanction of many surgeons.

The nucleic acid employed (Hefenucleinsaure) was furnished by Böringer, of Mannheim, Germany.

In commenting upon this paper the *Lancet*[1] says: "While it is yet early to pronounce definitely on the value of this prophylactic hyperleukocytosis we have facts enough before us to declare that the outlook of the process is exceedingly hopeful. We are justified in expecting that the developments which the future will reveal will enable us to guard against risks of septic infection even in cases where those risks now appear to be greatest."

Mariani[2] has been testing the resisting power against infection of the peritoneum of rabbits. He finds that laparotomy and handling of the intestine reduce it; it returns after a period of rest. It is also reduced by cathartics and large doses of morphine, but is increased by small doses of morphine and by atropine.

Helmberger and Martina[3] seem to have shown by experiments on rabbits that bacteria can only penetrate the intestinal wall of this animal when all of the coats are severely injured. Of the different coats considered separately the muscular layers seem to oppose the greatest obstacle to the bacterial exit.

Inflammation of the Peritoneal Cavity. The treatment of general peritonitis is still a subject for active discussion and will doubtless remain so until the mortality is far less than it is now in the hands of most surgeons. The estimate of the mortality from this disease is

[1] Lancet, 1904, vol. ii. p. 30.
[2] Il Policlinico, 1904.
[3] Deut. Zeit. f. Chir., 1904, vol. lxxiv. p. 527.

peculiarly difficult on account of the indefinite way in which general peritonitis is assumed to be present.

Blake's definitions of the different forms of peritonitis were given in PROGRESSIVE MEDICINE last year,[1] but they are so essential to the proper appreciation of his statistics and those of others that they are reprinted.

"I divide all cases of peritonitis into two main groups, localized and diffuse. The cases of localized peritonitis are those in which the products of inflammation are limited by adhesions, or, in other words, form an abscess. By diffuse peritonitis I mean an established progressive inflammation without definite limitations, evidenced by extensive redness of the peritoneum, a definite inflammatory exudate, a tendency to general involvement, and intestinal paralysis. These cases are conveniently subdivided into cases of spreading peritonitis, in which parts of the peritoneum can be demonstrated as free from the invasion; and general peritonitis, in which no part, possibly excepting the lesser sac, is uninvolved."

Blake operates as early as possible. He flushes the abdomen with large quantities of warm saline solution through a double current tube, to the outlet of which is attached a rubber tube so as to produce siphonage. He uses a cigarette drain which does not project more than half an inch into the peritoneal cavity. The after-treatment affords absolute rest for the alimentary canal and plenty of fluid for the vascular system. It is as follows: The stomach is washed out before the patient leaves the operating table, and no food is given per os until all tendency to nausea is past. When the general condition is very bad intravenous infusions are given; otherwise saline enemata or irrigations are employed. If nausea persists unduly, nutrient enemata are alternated with the saline enemata. If the patient is restless morphine is administered. When this treatment is thoroughly instituted postoperative paralysis of the intestine and distention are seldom to be feared. During the year previous to this report he operated upon 19 patients with diffuse peritonitis. There were 5 cases of general peritonitis with 2 deaths. One patient died from pneumonia, the necropsy showing that the peritonitis had resolved, leaving only one, a case of perforating gastric ulcer of forty-eight hours' duration, in which the death could be fairly attributed to the peritonitis *per se;* and 14 cases of spreading peritonitis, with 4 deaths, in 2 of which, as far as could be told by clinical evidence, the peritonitis had resolved, leaving 2 in which death was caused by a persistence of the process. This gives a total mortality of about 32 per cent. This is such an improvement upon that reported a few years

[1] PROGRESSIVE MEDICINE, June, 1904, p. 36.

ago in similar cases that Blake feels justified in predicting a lowering of the mortality to 20 per cent. in the near future.

GENERAL PERITONITIS. Hawkes[1] reports the treatment of 11 patients suffering from septic peritonitis following *appendicitis*—a treatment which was successful in all but 2 cases—mortality 18 per cent. Hawkes looks upon no case as hopeless unless the patient is in such a state that it can positively be said that he would die on the operating table. In order to save time the operator passes in mental review every step of the operation while preparations are being made; the anæsthesia (gas and ether) is given on the operating table, and is not commenced until all instruments, etc., are placed at hand. The patient lies in a dorsal position with the chest slightly elevated. The incision through the outer part of the right rectus muscle gives the best and quickest exposure. Two fingers are introduced into the right iliac region, and the appendix brought to view. Two hot pads wrung out of saline solution keep back the intestines and soak up pus. The mesoappendix is ligated with catgut and cut and the stump of appendix is ligated, cut, and cauterized. The diagnosis of general septic peritonitis is then made by passing successive fresh sponges (1) to the subhepatic and epigastric areas; (2) to the splenic area; (3) to the left iliac fossa; and (4) to the pelvis. Unless purulent fluid can be squeezed from each sponge when withdrawn the patient is not considered to have a *general peritonitis*. The 11 patients here mentioned had purulent material in all of these spaces. Next the patient's chest and upper abdomen are raised, and the abdominal cavity is irrigated through a large Chamberlain tube with several gallons of hot saline. This irrigation is begun in the upper abdomen and completed in the pelvis. As much fluid is left in the abdominal cavity as it will hold. From one to two ounces of magnesium sulphate dissolved in hot water is then injected into as high a loop of small intestine as is readily obtainable. The needle is passed obliquely through the intestinal wall, and after its withdrawal the puncture is closed with a catgut stitch. Two "cigarette" gauze drains are used—a large one reaching to the pelvis and a small one to the appendicular stump. The anæsthetic is stopped and the abdominal wall is sutured in a single layer, or if time permits in three. The patient is placed in a bed the head of which is raised sixteen inches above the foot. At the end of twenty-four or thirty-six hours the pelvic drain is no longer needed and is removed. These patients need free stimulation. The injected magnesium sulphate usually gives a movement in twenty-four hours. If not small doses of calomel followed by salts and enemata are employed. No one of the 9 patients who recovered suffered from abdominal adhesions.

[1] Report of Presbyterian Hospital, New York, 1904, vol. vi. p. 103.

The value of the *cigarette drains*—gauze wrapped in rubber tissue—is illustrated in the freedom from intestinal adhesions enjoyed by Hawkes' patients. Clinton[1] reports a case in which he flushed through both flanks and then drained with glass tubes wrapped with gauze (smooth on the inside and rough on the outside). Two subsequent operations were necessary, one for fecal fistula, one for adhesions.

In the address on "Surgery" at the 1904 session of the American Medical Association, Mayo[2] brought out in most forcible terms the necessity of operating early in *perforations of the upper abdomen.* He and his brother have performed 811 operations on the gall-bladder and biliary vessels. Four of these were for acute perforations of the gall-bladder, with 2 deaths, although the mortality in the non-perforative series was less than 5 per cent. There were 4 acute duodenal perforations, with 2 deaths; and 41 operations for non-perforative diseases, with only 1 death. There were 5 perforations of the stomach, with 2 deaths, and 1 operation for acute pancreatitis and fat necrosis, with recovery. This makes 14 operations for acute perforation, with a mortality of 50 per cent., and over 1150 operations for subacute and chronic benign lesions of the same organs, with a mortality of a little less than 5 per cent. If we add to this mortality of 50 per cent. in operations for acute perforation, the cases seen in a moribund condition beyond an attempt at relief, and the greater number in which death occurs without an ante-mortem diagnosis, we get some idea of the appalling nature of the disaster. To be successful, the operation must be immediate. The condition is as imperative as hemorrhage from an artery of the third class. Few patients recover if operated on later than ten hours after perforation.

Deaver[3] read a paper on the "Mortality of Appendicitis" at the 1904 meeting of the American Medical Association. In the lively discussion which followed, personal remarks were not altogether absent. As far as it possessed a scientific character, this discussion was chiefly devoted to the treatment of patients with peritonitis. Deaver stated in this paper that he does not operate on patients with general peritonitis of several days' duration, as they are very likely to die.

In the preceding five months he had operated upon 159 cases of acute appendicitis, with a mortality of 5 per cent. plus. In this list were included 16 cases of general peritonitis without a death. None of these patients had been ill more than a few hours. He did not state on what he based the diagnosis of general peritonitis.

La Place believes in irrigation with sterile water, which he considers less irritating to inflamed tissues than saline solution.

[1] Buffalo Medical Journal, 1904, vol. xliii. p. 823.
[2] Journal American Medical Association, 1904, vol xlii. p. 1525
[3] Ibid., vol. xliii. p. 859.

Wathen said that it is better to avoid the irritation of flushing and sponging the peritoneal cavity. "Do not irrigate, do but little sponging, and drain from the lowest part of the cavity by a large gum tube. If the infection is virulently streptococcic, the patients will die under any treatment."

Ochsner reported the results in the treatment of 1000 cases of appendicitis. Among them were 117 cases of perforated appendix in which the infectious material was not circumscribed. Many of these patients seemed to be suffering from diffuse peritonitis when they entered the hospital. They had a bad facial expression, cold perspiration, distention of the abdomen, and contracted abdominal muscles, so that 78 of them were treated for a time by starvation, gastric lavage, and rectal feeding. Only 4 of the 117 died after operation. There were also 33 patients suffering from diffuse peritonitis when they entered the hospital. Seven were in such bad shape that they were not operated upon; 3 others died after operation, making a total of 10 deaths, or 30 per cent., in this class of cases. In this hospital no patient is refused admission because he is too sick.

Murphy reported 16 consecutive operations for general suppurative peritonitis, the result of perforations of the stomach, duodenum, intestine, and appendix, with only 1 death. Formerly patients were killed on the table because too much work was done in the abdomen at the time of severe toxæmia and severe depression. Pus retained under pressure is rapidly absorbed, whether it be in the peritoneal cavity or elsewhere, and to stop absorption, all that is necessary is to relieve the tension. There should be no washing, no sponging, no handling of the viscera. He puts a rubber drain in the rectovesical fold and places the patient in a semi-sitting posture.

Syms[1] is convinced that general peritonitis following appendicitis is necessarily a fatal condition. His method of dealing with these cases, when the disease is not walled in nor localized by adhesions, is to remove the diseased appendix and any gangrenous mesentery or omentum, to cleanse the local field with hydrogen peroxide, and to mop out the excessive excretion. He no longer resorts to flushing in any case, and he does not use widespread gauze packing in the abdomen, but attempts merely to thoroughly pack the original site of the disease in a way that will drain it.

He reports operating upon 19 patients in this condition by himself and his assistants, with 19 deaths. From this group is excluded all cases in which the peritonitis was considered more or less diffuse, but not general.

[1] Annals of Surgery, 1904, vol xl. p. 727.

POSTURE AFTER OPERATION. R. S. Fowler[1] reports 100 cases of well-marked septic peritonitis following *appendicitis* operated upon by G. R. Fowler and himself, with 67 per cent. of recoveries. The abdominal cavity was flushed and extensively drained, and the patient's shoulders were elevated not less than twelve inches. In 1900 G. R. Fowler[2] reported 9 successive cures of general peritonitis by flushing, drainage, and the elevated position, thus showing how unreliable may be an inference drawn from a small number of cases.

Küster[3] believes that the patient's chances are improved by turning him on his face for a few hours, so as to ensure perfect drainage of the peritoneal cavity. Experiments upon the cadaver show that substances, such as a solution of methyl blue, injected into the various pouches of the peritoneal cavity will all drain outward in a few minutes if the body is turned on its stomach, in case of a median incision, and a little to one side if the incision is a lateral one. The point is to so place the body that the incision shall be at the lowest point of the peritoneal sac. Whenever this is accomplished there is prompt drainage of all contained fluid. This position is borne by a patient with comparative comfort, if the chest and head are supported upon rather firm pillows, and the feet can be pressed firmly against the footboard. If necessary, the pelvis can also be raised above the level of the bed. There must, of course, be a sufficient opening in the abdominal wound to permit the escape of the contained fluid.

Küster reports 6 cases in which this position was employed, either immediately after the operation or at some time during the convalescence, to facilitate the escape of retained secretions. He also advocates the change of tampons and drainage-tubes in this position, so that retained secretions may freely escape. Four of the patients thus treated recovered, but the variety of their lesions, and the fact that in some of the cases the peritonitis was distinctly circumscribed, makes it inadvisable to record them as cures of general peritonitis. The 2 fatal cases are, on the other hand, not to be attributed to the position, as one of the patients died from pneumonia, and the other from rupture of the sigmoid colon, occurring five days after operation, through a partial rent in its wall.

ENTEROSTOMY IN PERITONITIS. Busch[4] gives a further report from Heidenhain's clinic of the good effects of enterostomy in peritonitis, which was advocated by Heidenhain before the Congress of German Surgeons in 1902. This treatment rests on the principle that neither cathartics nor nourishment can be given with benefit until the passage through the intestine is free. In certain cases in which the intestine is

[1] Medical News, 1904, vol. lxxxiv. p. 1011
[2] Medical Record, 1900, vol. lvii. p. 617.
[3] Arch. klin. Chir., 1904, vol. lxxiii. p. 1074.
[4] Deut. Zeit. f. Chir., 1904, vol. lxxiv. p. 215.

paralyzed by inflammation, enterostomy gives a free exit to the contents.

Gebhart[1] enthusiastically praises enterostomy as a preventive and cure of threatened or commencing general peritonitis, reporting 8 cases in which it was employed to relieve the ileus. Six of the patients recovered, and the fistulæ closed spontaneously. Two died, 1 from carcinoma, and 1 from many adhesions and obstructions which two subsequent operations failed to overcome. The relief of ileus due to such mechanical means is, of course, not quite the same as the ileus of paralysis in acute peritonitis.

Abdominal Abscess of Thoracic Origin. Williams[2] calls attention to the fact that abscesses at the base of the lung following *pneumonia* generally perforate downward into the abdominal cavity, while abdominal abscesses often perforate upward into a bronchus. Two cases are cited in illustration. In the first, a young man suffered from pneumonia and pleural effusion following influenza. Four pints of fluid were withdrawn by aspiration of the left side, and later two pints. The temperature continued high at night, with morning remissions, and operation was advised but refused. The patient lived three months from the beginning of his illness. Shortly before his death the abscess perforated into the abdomen, probably into the colon.

In the other case the patient became violently ill three days after a miscarriage, with high temperature, an offensive vaginal discharge, pelvic tenderness, abdominal distention, and a rounded swelling under the costal margin in the left midaxillary line. The dulness over this swelling was continued upward to the fifth rib. Three weeks later reddish pus was aspirated through a large needle inserted between the seventh and eighth ribs. A portion of the eighth rib was excised, the pulmonary tissue overlying the lung was cut through, and the abscess was drained. About ten ounces of offensive pus were evacuated, and the cavity drained. Recovery was slow but complete. In this case the visceral and costal layers of the pleura were not united, yet no empyema resulted.

Surgical Treatment of Ascites. Monprofit[3] enumerates the various operations for the relief of ascites due to *cirrhosis of the liver*. 1. Paracentesis. 2. Simple laparotomy. 3. Laparotomy with drainage. 4. Vaginal laparotomy. 5. Omentopexy or Talma's operation. 6. Porto-cava anastomosis or establishment of Eck's fistula. This last operation was transferred from experimental to clinical surgery by Vidal, who successfully divided the portal vein and implanted it into the side of the vena cava. The patient recovered from the operation, but died very suddenly four months later with symptoms of infection throughout the veins,

[1] Deut. Zeit. f. Chir., 1904, vol. lxxiv. p. 20.
[2] British Medical Journal, 1904, vol. i. p. 8.
[3] Revue de Chir., 1904, vol. xxx. p. 600.

derived from the intestinal tract. There was a sudden chill, coma, and delirium, and death in twenty-four hours.

The operation of *omentopexy* has been uselessly modified and complicated by many surgeons. Its mortality varies with the condition of the individual. It may be stated as 15 per cent. in hypertrophic cirrhosis and 40 per cent. in atrophic cirrhosis. There would be fewer deaths if operation were always performed as soon as it is evident that medical means are inefficient, *i. e., at the commencement* of the ascites. In the list of operations hitherto reported (224), 70 are said to have resulted in a complete cure (35 per cent.).

Porto-cava anastomosis cannot replace omentopexy, but in certain cases it may be indicated. The risk of death from the direct entrance into the general circulation of substances absorbed from the intestines can be minimized by keeping the patient upon a diet of carbohydrates.

Jayle advocated a subumbilical incision in women, as the cause of the ascites may be found in some pelvic lesion instead of the liver.

Willems questioned Monprofit's statistics of cures, saying that a collection of cases made by a German author showed only 10 late cures in 250 cases. He also stated that ascites is held by some to be due to a toxic condition of the blood due to insufficient function of the liver. Should this theory prove correct, omentopexy would appear to be a useless operation.

Tuffier advised bacteriological examination of the ascitic fluid. In 1 of his cases it was tuberculous.

Delagénière has been impressed favorably by temporary cholecystostomy with omentopexy and hepatopexy. He reported several successes. He looks upon cirrhosis of the liver as an infective trouble of intestinal origin.

Vidal thinks omentopexy is indicated as a relief of hemorrhage with ascites. The symptoms are due to portal hypertension, and can be relieved by Talma's operation.

Bardesco reported 6 cases, with 4 cures, after periods varying from fifteen to twenty-eight months. He operates as follows: General anæsthesia. Paracentesis. Median incision from umbilicus to ensiform. Removal of any fluid by sponging. Exposure of both recti muscles by incisions from within the peritoneal cavity parallel to the median line. Dissection with the finger of the anterior surface of each rectus muscle, forming a pocket, in which the free portion of the omentum is placed. Fixation of omentum by suture to the peritoneum at the edges of the three peritoneal wounds. Closure of the wounds.

ADRENALIN INJECTIONS FOR ASCITES. Barr[1] found the injection of 1 ounce of adrenalin chloride solution, 1:1000, a valuable preventive

[1] British Medical Journal, 1904, vol. i. p. 649.

of reaccumulation of pleuritic effusion after tapping. He extended this treatment to the abdomen, injecting 3 drachms after tapping for ascites. If the ascites is due to a mechanical obstruction, the adrenalin has little or no effect; but the results in tuberculous and some other forms of ascites warrant a further trial. At the present time Barr combines the adrenalin injection with the injection of 4 pints of sterilized air into the peritoneal cavity, hoping thereby to prevent the formation of adhesions.

Fatal Tapping in a Case of Malignant Ascites. A case of *intestinal puncture* during paracentesis is reported by Gwyn.[1] Ascites due to malignant disease in the abdomen was relieved by the withdrawal of eleven quarts of dark fluid. Blood flowed from the wound at the close of the paracentesis. One month later twelve quarts of bloody fluid were removed, with relief to the patient. Ten days later six quarts of fluid were removed, and just before removing the cannula some gelatinous and granular material escaped, found on microscopic examination to consist of masses of tumor tissue, intestinal material, starch, and meat and vegetable fibres, proving that the intestine had been punctured. In six hours there was collapse, followed by symptoms of peritonitis, and death in three days. The paracentesis was performed by a surgeon at a point below the umbilicus in the median line. The skin was cocainized and incised before the trocar was inserted. The patient experienced little pain.

Can the Vena Cava Be Ligated? In 1892 Mackintosh[2] reported a case of *thrombosis of the vena cava* complicating typhoid fever, in which the patient recovered. This was said by Keen,[3] writing six years later, to be the only recovery on record. Some of those to whom Mackintosh showed the patient after recovery questioned his diagnosis, saying that perhaps both internal iliacs were involved. The flow of blood was accomplished by enlargement of the internal mammary, superficial epigastric, external pudic, internal saphenous, and circumflex iliac veins of both sides. The vitality of the legs was at no time in danger, though œdema was great and persisted for a long time.

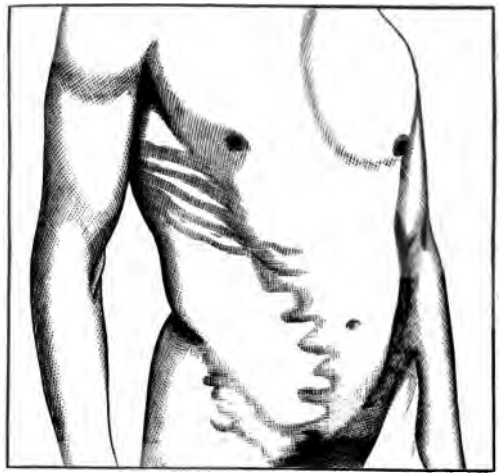
In a case reported by Huey,[4] swelling of the right leg came on about five weeks from the onset of an attack of enteric fever, and that of the left leg a few days later. The circulation was so poor in the left leg that amputation was considered, but was postponed on account of the feeble condition of the patient. Soon after the superficial abdominal veins began to swell, and the circulation in both legs improved. The condition a year later is shown by the accompanying illustration (Fig. 36).

[1] American Journal of the Medical Sciences, 1904, vol. cxxvii. p. 593.
[2] Glasgow Medical Journal, 1892, vol. xxviii.
[3] Surgical Complications, etc., of Typhoid, 1898, p. 68.
[4] Journal of Royal Army Medical Corps, 1904, vol. ii. p. 593.

This case has a bearing on the possibility of successful ligation of the vena cava.

Aneurysm of the Abdominal Aorta. An interesting case of abdominal injury is reported by Brentano.[1] A man aged twenty-five years was shot in the ninth left intercostal space. He presented mild symptoms of shock and the abdomen was opened. There was a small retroperitoneal hæmatoma, but no organs were injured. The patient did fairly well until the seventh day, when he died rather suddenly. Autopsy showed that the bullet had passed clear through the aorta just above the renal arteries. The hemorrhage had been limited for several days, but finally burst through into the peritoneal cavity with sudden fatal results. In

FIG. 36.



Dilated and tortuous superficial veins, the result of thrombosis of the vena cava. (HUEY.)

such a case as this suture might have been employed, or the method of plaster strapping suggested by Brewer,[2] and tested upon animals. He found that hemorrhage from a large vessel can readily be controlled by wrapping around it a thin, very adhesive sterile rubber plaster, much as an electrician wraps an exposed wire with rubber tape.

Reinsholm[3] has described a method of invagination and suture which he has used with success on the carotid of large animals and believes might be employed with success upon the human aorta. There are four steps in the operation: 1. The proximal end of the divided vessel is shaved down to the shape of a slim truncated cone. 2. A thread

[1] Centralblatt für Chirurgie, 1904, Beilage, p. 51.
[2] Annals of Surgery, 1904, vol. xl. p. 856.
[3] Nord. Med. Ark., 1903, AFD I, N:R. 3, p. 103.

with a needle on each end is passed transversely through it. The two needles are then passed from the lumen outward through the wall of the distal end of the vessel. They should emerge exactly opposite each other. 3. The mouth of the distal end is held open while by means of the traction thread the proximal end is invaginated into it. 4. Superficial catgut sutures are inserted through the adventitia of both vessels, and the traction thread is cut off and withdrawn.

Retroperitoneal Tumors. SARCOMA. Steele[1] has written a review of 96 cases of retroperitoneal sarcoma, including 5 cases from his own

FIG. 37.

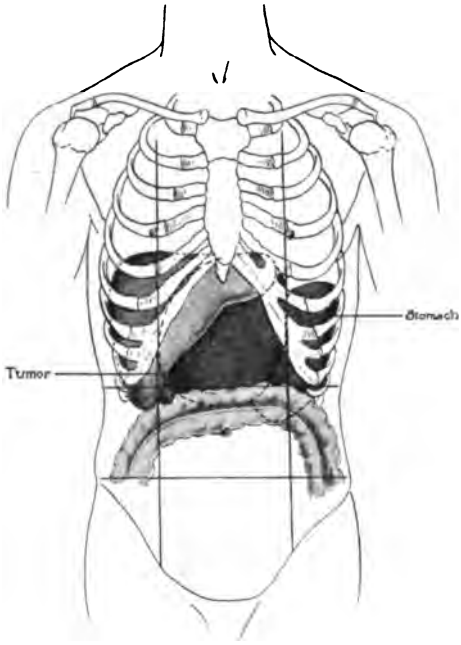


FIG. 38.

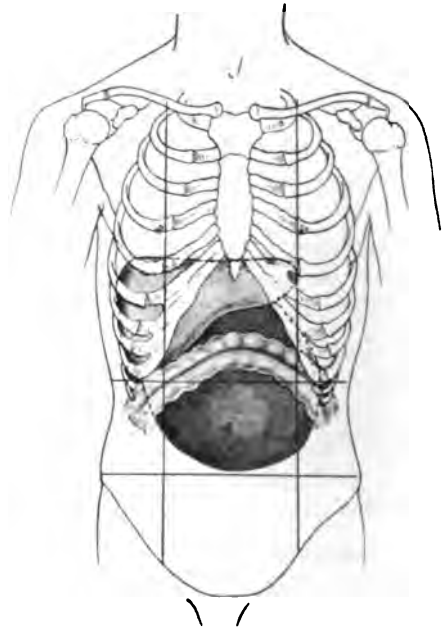


FIG. 37.—Case I. Retroperitoneal sarcoma. The transverse colon is pushed forward and crosses the anterior lower half of the tumor. The stomach is pushed forward and to the left. Compare Fig. 40. (STEELE.)

FIG. 38.—Case III. Retroperitoneal sarcoma. The colon is pushed forward, but crosses the upper half of the tumor instead of the lower half, as is usual in upper central retroperitoneal tumors. (STEELE.)

experience. The prognosis in these cases is hopeless except when the tumor can be removed, and is even then gloomy enough. The practical point of interest is naturally the possibility of an early diagnosis before metastasis has occurred, and before the tumor has assumed such a size that the patient cannot survive the loss of blood attendant on its removal. Steele says the diagnosis cannot be made until the tumor can be felt.

[1] American Journal of the Medical Sciences, 1904, vol. cxxvii. p. 939.

As the symptoms are due to pressure, they vary with the situation of the tumor. If it is in the upper central region, or right or left upper quadrant, there are gastric disturbances—pain and nausea after eating and later vomiting. If the tumor is in the lower half of the abdomen the symptoms are more pronounced. In either lower quadrant there is œdema and pain of the corresponding foot and leg. If in the pelvic region there is disturbed micturition, frequent at first, and later frequency and almost obstruction of micturition from pressure on the bladder. The relations of the stomach and colon to the tumor is

FIG. 39. FIG. 40.

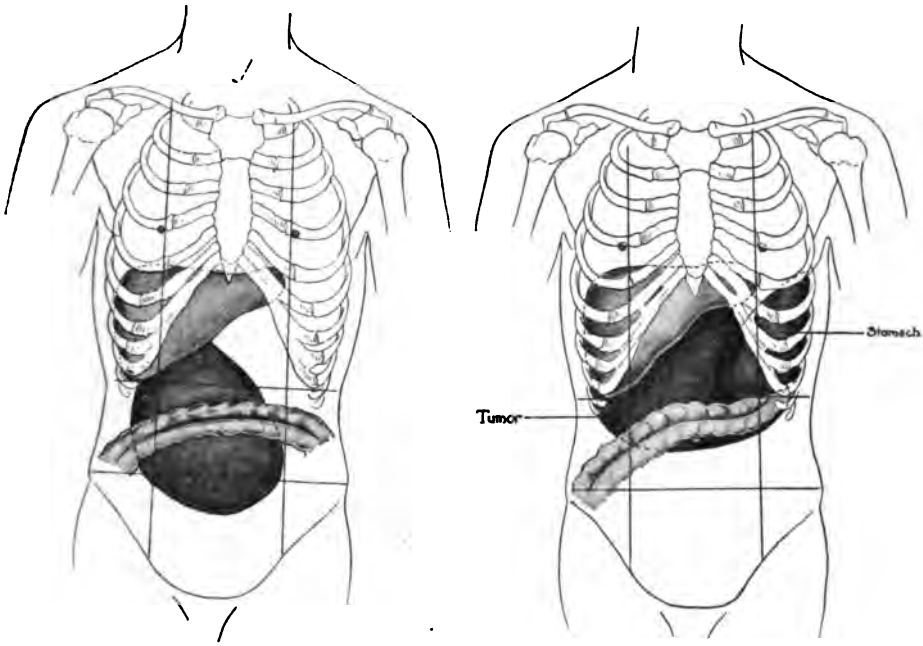


FIG. 39.—Case VI. Carcinoma of the right kidney. The colon is pushed forward and crosses the anterior surface of the tumor (STEELE.)

FIG. 40.—Case VII. Aneurysm of the abdominal aorta. The colon is pushed forward and crosses the anterior and lower half of the tumor. The stomach is pushed forward and to the left. Compare Fig. 38. (STEELE.)

one of the most important diagnostic points; and yet a comparison of Figs. 37, 38, 39, and 40, all drawn from actual cases, shows with what care the results of such investigation must be considered.

The tumor is at first immovable, hard, and elastic, but is prone to undergo degeneration, and it is then soft and fluctuating in spots. By this it may be distinguished from other solid tumors of the retroperitoneal space.

SUPRARENAL GLANDS. Tumors of the suprarenal are rarely seen by the surgeon, and it is no wonder that operators are not agreed as

to the best incision for their removal. Wendel[1] has collected from literature reports of 23 operations for such tumors, 18 of which were positively malignant and 2 others probably malignant. In 6 cases the tumor was attacked through the lumbar incision. Four of these patients died from the effects of the operation, and the other 2 in a short time from a continuance of the growth. The transperitoneal operation was performed 17 times with 7 deaths. Four of the survivors died from extension of the growth, but the remaining 6 were free from recurrence at the time of report. Wendel therefore concludes that the transperitoneal operation is less dangerous than the lumbar, and that it gives the surgeon a better chance to remove the whole of the neoplasm without the sacrifice of the kidney, should this be found to be unaffected by the disease.

This view has not been held by all surgeons. Thus Schede says that the lumbar incision is the incision of the future for the removal of suprarenal tumors just as it is now generally recognized as the incision of choice for renal tumors. Wendel holds that the conditions in case of a renal tumor are quite different. The urinary symptoms, accessibility to palpation, cryoscopy, ureteral catheterization, all enable the surgeon to make an early diagnosis and to know before operation the condition of the other kidney. Furthermore, the kidney itself is so large that a tumor within it can reach a considerable size before it extends beyond the limits of the renal capsule. In the case of a suprarenal tumor the diagnosis can rarely be made before operation, and the transperitoneal operation, while giving the operator a better chance to make a correct diagnosis, is also a less dangerous method of removing the tumor should it prove to be one of the suprarenal. If on account of a mistaken diagnosis, or for any other reason, a lumbar incision should be found to be preferable, the abdominal incision can be closed and the lumbar one made.

THE LIVER.

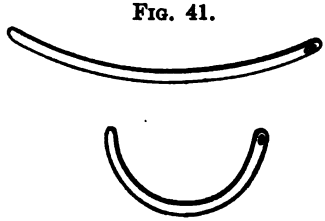
Control of Hepatic Hemorrhage. Tricomi[2] discusses the various methods of controlling hemorrhage in wounds of the liver, no one of which he thinks is applicable to all cases. Simple suture, for example, acts satisfactorily in superficial wounds, but it is of no avail in gunshot or other deep wounds. In such wounds tamponade is indicated. The use of *suprarenal extracts* he warmly commends. Experiments upon animals showed him that a single application will sometimes control bleeding, while subsequent dilatation of the vessels and secondary hemorrhage

[1] Arch. klin. Chir., 1904, vol. lxxiii p. 998.
[2] Gaz. degli ospedali, etc., 1904, vol. xxv. p. 259.

is not to be feared. There is some reaction of this character, but it rarely leads to serious hemorrhage, apparently because the primary contraction due to the suprarenal extract lasts long enough to favor the formation of firm thrombi.

Partial resection of the liver and the best means of controlling hemorrhage are considered at length by Anschütz[1] in a valuable article, in

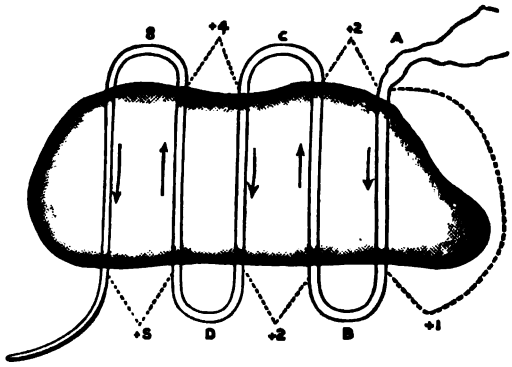
FIG. 41.



Kusnezoff and Pensky's hepatic needles.

which he gives brief accounts of almost 100 cases. His conclusions are as follows: The control of hemorrhage after resection is applicable only to small wounds of the liver. In resecting large portions measures to prevent hemorrhage should first be employed, and in most cases the resection should be made dependent upon their success. Compression of the portal vein may help in an emergency, even though it merely

FIG. 42.



Intrahepatic ligatures of Kusnezoff and Pensky. A long double thread is employed. The threads are cut and tied alternately above and below the liver, as shown by the dotted lines. In this manner all the tissue is included in the ligature.

lessens the flow of blood. An elastic ligature around the liver is also a temporary measure not to be kept up very long. By far the most reliable method of preventing hemorrhage in extensive resection is the insertion of deep intrahepatic mass ligatures. These must naturally be drawn tight in order to compress the tissue. Figs. 41 and 42 give

[1] Volkmann's Klin. Vörtrag., 1903.

an idea of the blunt needles employed and the manner of their insertion. In lesser wounds one may trust to ligation and suture after the incision is made. Tamponade will usually control the hemorrhage after curettage. The cautery is useful to stop capillary bleeding. Hot air and steam are not recommended.

Recurrence of Hepatic Abscess. Schlayer[1] calls attention to the fact that a patient who has been operated upon with success in the tropics for an abscess of the liver may have a recurrence of his trouble after months of apparently sound health. The recurrence may follow some blow or strain, or it may develop without apparent cause. It is noticeable that the symptoms of a recurrence are by no means so violent as those of a primary acute abscess. There is a slight afternoon fever, perhaps up to 102.5°, but without chill. There is no icterus and the respiration is not embarrassed. The liver is only slightly tender. There is a slight leukocytosis, say of 10,000, which at times may reach 17,000. If there are no definite signs to indicate the position of the abscess, the incision should be made through the old scar.

Suppurative Cholangitis. The following remarkable series of operations is reported by Schelble:[2] A man aged sixty-one years had suffered for thirty-five years from infrequent attacks of biliary colic. Finally, after four weeks of ineffectual attempts to improve his condition by internal treatment, the abdomen was opened along the border of the right rectus. The liver was enlarged and congested and the omentum adherent to it. The adhesions were separated; the gall-bladder could not be found, the biliary passages seemed free from calculi, and the abdomen was closed. The irregular fever and chills and pain continued as before, so that four weeks later the abdomen was again opened and the liver incised after puncture for an abscess. A small amount of pus was obtained. The abscess cavity was drained and for two months the patient was improved. Return of his old symptoms led to another laparotomy, but repeated puncture and incision of the liver failed to reach pus. The wound was drained and on the following day discharged foul bile. Three weeks later as the fever continued the liver was for the fourth time exposed and divided transversely to drain the suppurative cholangitis now seen to exist. Fever continued, and pain and dulness on the left side seemed to indicate a subphrenic abscess. The syringe drew bloody serum and through an incision below the left costal margin 250 c.c. (half a pint) of this fluid was evacuated. The diaphragm was sutured to the upper margin of the wound before the abscess cavity was found. Five days later the patient in coughing incarcerated a right inguinal hernia. This was cured by operation, and at the same

[1] Münch. med. Wochensch., 1904, vol. li. p. 343

[2] Ibid., p. 434.

time an old hydrocele sac was found to contain pus and it was dissected away. Three weeks later a portion of the eighth rib was resected for empyema secondary to the subphrenic abscess, making seven major operations in seven months. The further convalescence was uneventful. The fever was all gone in a month, and the liver regained its normal size, though a small fistula was still present after four months. The pigmentation of the skin (not icterus) continued. The lung expanded promptly and the thoracic wound healed entirely.

Tuberculosis of the Liver. The excision of a tumor of the liver found on examination to be tuberculous is chronicled by Rome.[1] The tumor was in the right lobe and had caused adhesions between the liver and intestine, and the liver and the parietal wall. After these were freed it was seen that the removal of the tumor could be accomplished by cutting out a wedge from the margin of the liver. Catgut sutures were inserted before the excision was made, beginning at the apex of the triangle to be excised and passing through the thickness of the lobe. These were inserted about one-half inch apart and about one-half inch back from the line of incision. As soon as the excision was made the sutures were drawn up and tied. In this manner the hemorrhage was quickly controlled. The patient made a good recovery.

Hanbold[2] reports the removal of a tumor which in situation and on physical examination closely resembled the above, but on microscopic examination by several pathologists it was pronounced *sarcoma.* The growth was removed by blunt dissection. The normal liver tissue was torn through with a closed pair of scissors, and the trabeculæ of Glisson were clamped and tied before division. The venous hemorrhage was controlled by tamponade of gauze soaked in hot saline solution. Drainage was employed and the wound suppurated, but the ultimate recovery was good.

Syphilis of the Liver. Some surgeons believe that *gumma of the liver,* if recognized, should not be excised, but that the abdomen should be closed and the patient given antisyphilitic treatment. This is the view expressed by Anschütz,[3] but the diagnosis of a single gumma of the liver in a patient who perhaps has given no history of syphilis is such an uncertain one that this advice must often be overlooked.

Cyst of the Liver. Doran[4] was called to operate upon a woman suffering from deep jaundice and great enlargement of the liver. There were frequent semisolid white stools. An incision along the right rectus exposed a large cyst with semiopaque greenish-brown walls, from which two pints of bile were removed by aspiration. The cyst was situated

[1] Annals of Surgery, 1904, vol. xxxix. p. 98
[2] Ibid., p. 240.
[3] Volkmann's Klin. Vörtrag., 1903, Nr. 356 and 357
[4] British Medical Journal, 1903, ii. p 1151.

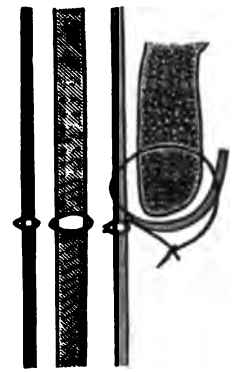
in the quadrate lobe. Behind it were the gall-bladder, cystic, hepatic and common ducts, collapsed from pressure. The cyst was drained and the jaundice gradually disappeared. Bile was present in the stools from the third week, and the fistula narrowed until in seven months it was only two and one-half inches deep and discharged merely a little pus.

Doran mentions 6 other cases of simple cyst of the liver reported by Bird, Bayer, Winckler, North, Robson, and Miller.[1] The first three of these patients did not suffer from jaundice, nor cholelithiasis; the fourth and fifth had bile cysts, probably the result of obstruction by calculi while the bile cyst in the sixth patient—a child of three years—was probably of congenital origin. Doran believes that the cyst in his patient was of the same origin.

FIG. 43.

Support of the liver in a peritoneal pocket: 1, skin; 2, abdominal muscle; 3, peritoneum. (DEPAGE.)

FIG. 44.



Support of the liver Sutures inserted. (DEPAGE.)

Displacement of the Liver. Depage[2] has cured downward displacement of the liver, or *hepatoptosis*, by placing the patient in Trendelenburg's position, replacing the liver, making a six-inch incision parallel to and one inch below the free border of the ribs, and turning up the cut edge of peritoneum under the edge of the liver and suturing these structures in the manner shown in Figs. 43 and 44.

THE GALL-BLADDER AND BILE-DUCTS.

The Symptom Pain in Disease of the Gall-bladder. Bishop[3] reports some cases illustrative of the fact that attacks of colicky pain in the right hypochondrium do not always denote the presence of a calculus.

[1] PROGRESSIVE MEDICINE, June, 1904, p. 112.
[2] Arch. klin. Chir., 1904, vol. lxxiii. p. 1081.
[3] British Medical Journal, 1904, i. p. 886.

These attacks are usually intermittent and often coincide with the passage of food from the stomach into the duodenum, that is, two or three hours after a meal.

Normally the gall-bladder is attached to the under surface of the liver by connective tissue, and by the peritoneal coat, which is reflected from the surface of the liver over the gall-bladder and keeps the two in contact, so that in most cases only the fundus is free. If for any cause congenital or acquired the gall-bladder has an unusual amount of motion the cystic duct may kink, producing an attack of colic, due to the unsuccessful attempts of the bladder to expel its contents. This at least is the theory of Krukenberg, and it seemed to explain the colic in one of Bishop's cases. At operation the gall-bladder was seen "full but not distended," was entirely free from the liver, hanging down behind the first portion of the duodenum, to which, however, it was not attached. The cystic duct, firmly attached, was bent at an angle. The bladder contained eighteen small facetted calculi. These were removed and the bladder lifted up and drained for nine days with a rubber tube. Recovery was perfect.

Paroxysmal pain may also be due to adhesions between the gall-bladder or liver, and the stomach, duodenum, colon, or omentum, no calculus being found at operation. Bishop assumes the sequence of events in these cases to be: 1. A mild attack of cholecystitis followed by the formation of a calculus. 2. Passage onward of this concretion, the irritation of its passage setting up some local peritonitis around the gall-bladder, and its consequent adhesion to the viscera around it. 3. Pressure upon or kinking of the cystic duct produced by the contraction of these adhesions. Three cases of this character are cited.

Preoperative Treatment for Gallstones. Decker[1] comments on the great frequency of gallstones which he has found present in more than 10 per cent. of all his necropsies during the past two years. The highest percentage reported to date was from Strassburg, where one-fourth of all cadavers over sixty years of age had gallstones. He says that the disposition to gallstones is often acquired at school but can be corrected by proper attention to gymnastic exercises and active games. It is well to remember that in fully one-half of the cases jaundice is absent, and that the first important symptom is pain in the region of the stomach, which is usually attributed to gastritis. When a patient complains of pain in this region the liver should be systematically examined, and if there is the least suspicion of gallstones the following treatment should be carried out morning and afternoon for three or four weeks. Six or eight glasses of hot Carlsbad water are taken at fifteen minutes' intervals early in the morning while the patient remains

[1] Münch. med Wochenschr., 1904, vol. li., p. 1727.

in bed. Hot applications are made to the hepatic region and a hot bath is given, to be followed by hot applications for another hour. This treatment is repeated in the afternoon. Deep breathing exercises are also helpful. Decker says that if the physician will make an early diagnosis, and put his patient through a course of this treatment for three or four weeks, he will usually be able to keep him out of the hands of the surgeon. The course of treatment should be repeated the following year.

Operative Treatment for Gallstones. Richardson[1] read a paper on diseases of the biliary tract before the Section on Surgery and Anatomy at the 1904 session of the American Medical Association. The paper confirms the principles that have for the past two years been made familiar to the readers of PROGRESSIVE MEDICINE through the reports of papers on this subject by the most advanced surgeons of the old and new worlds. Richardson's conclusions are:

1. Gallstones should be removed whenever they are known to exist, whether they offend or not, provided the patient's general and local conditions are favorable.

2. Drainage should be employed until the bile spontaneously ceases to flow through the wound.

3. Hernia in the scar is best prevented by a muscle-splitting incision, care being taken to avoid the motor ends of the intercostal nerves.

4. Biliary fistula meant a common duct obstructed usually by a gallstone, and it requires a second operation to close it, or a cholecystenterostomy.

Cholecystostomy or Cholecystectomy. Three years ago Moynihan[2] advocated removal of the gall-bladder in preference to cholecystotomy in conditions which make it certain or unlikely that the bladder can ever regain its function. Such conditions are severe injuries, gangrenous, or phlegmonous or membranous cholecystitis or chronic cholecystitis with great thickening of the walls of the bladder, distention due to obstructions of the cystic duct, ulcers, fistulæ, or malignant disease. Further experience with cholecystectomy has led him to advocate it in preference to cholecystotomy in almost all cases of gallstone disease. Its advantages are that the operation removes the chief source of the disease, that it thereby prevents in great measure a recurrence either of stones or of the inflammation which betokens their presence, that growths in the gall-bladder or adhesions around it are subsequently impossible, and finally, that the wound, if drainage is not required, may be caused to heal throughout by first intention. The gall-bladder is devoid of any strikingly useful purpose and its removal does not add to

[1] Journal of the American Medical Association, 1904, vol. xliii. p. 663.
[2] Lancet, 1904, ii. p. 1190.

the danger of the operation. If drainage of the ducts is necessary it can be carried out quite satisfactorily. The presence of a stone in the common duct does not prohibit the operation, but drainage of the duct, after removal of the stone in the duct or in the ampulla, is necessary. The one disadvantage that may justly be urged against cholecystectomy is this: that if a late operation should become necessary—for stones can and do form in the hepatic and common duct—such an operation would be more difficult and almost certainly more dangerous. The possibility of a further operation being necessary cannot be denied but the likelihood of it is negligible.

The operation of complete cholecystectomy is performed by Moynihan in the following manner: A vertical incision near the outer margin of the right rectus muscle is made and the muscle fibres are split. The usual length of this incision is five inches. If additional room be required it is best obtained by continuing the upper end of the incision along the costal margin upward and inward. All adhesions of the gall-bladder and ducts and liver having been cleared, the liver is rotated by gentle traction upon the gall-bladder until the cystic and common ducts are straightened and brought upon a level with the wound. By this manœuvre the operation is rendered simpler and quicker. The gall-bladder may now be removed from before backward or from behind forward. Moynihan now prefers to divide the cystic duct and to secure the cystic artery before freeing the gall-bladder. By dragging upon the gall-bladder the cystic duct is made clearly discernible. Its peritoneal investment is divided and stripped up along the duct toward the hepatic and common ducts, so that a cuff of peritoneum is raised up from the cystic duct. The latter is divided after securing it with a catgut ligature and the cystic artery is also defined and secured. The peritoneal cuff is then turned over the divided end of the duct and sutured. If it is intended to drain the common duct no ligature on the cystic duct is necessary. The cystic duct is cut off at its junction with the hepatic and common ducts and into the opening that is left a rubber drainage-tube is stitched. The gall-bladder is then stripped up from behind forward. The separation from the liver is readily effected by stripping up with the finger around which a thin strip of gauze is rolled. The peritoneum which passes from the liver to the gall-bladder is cut with scissors about three-quarters of an inch away from the liver, so that after removal of the gall-bladder the bared surface of the liver may be covered in by peritoneum. There is occasionally some bleeding from the denuded liver. This is readily checked by a suture or by the firm pressure of a hot swab or sponge. If the common duct is drained it is well to put in two other drains, one to the inner side of the duct toward the duodenum and one to the outer side toward the kidney pouch. These drains,

whether of gauze or of rubber tubing, should be stitched in position by one or more sutures of catgut and they are left in eight to ten days. At the end of this time their removal is quite easy. It is necessary to stitch them in position in order to prevent their being moved away within a few hours on account of the constant movements of the liver during respiration.

Lilienthal[1] says of cholecystectomy:

1. While not absolutely ensuring a cure of cholelithiasis, it is the most radical procedure at our command.

2. The primary operation is far safer than the secondary.

3. Judging by my own experience in a sufficient number of cases to warrant an opinion, I believe that primary cholecystectomy is, on the whole, an operation at least as safe as appendectomy.

Report is given of 42 primary cases with only 1 death from sepsis, streptococcus inflammation of the gall-bladder being present at the time of operation. Five patients suffered from bronchopneumonia usually of the right lung, but recovered. In no less than 6 cases there was a recurrence of pain resembling colic, but in only 2 of these did jaundice recur. Two patients passed stones subsequent to operation.

The technique of operation as perfected by Lilienthal is as follows: An incision from two to four inches long splits the fibres of the upper portion of the right rectus. The peritoneum is incised and the gall-bladder brought to the wound. If it is tense it is aspirated, and then clamped or ligated to prevent leaking. A broad cross-piece on the table is then elevated about six inches. This apparatus takes the place of the sandbag and is a marked improvement. The gall-bladder is drawn firmly forward while its peritoneal coat is incised about half an inch from the liver and peeled off with scissors and fingers. When the bladder is free as far as the cystic duct this is clamped by an instrument the jaws of which are at a right angle to the handles, and a chromic gut or silk suture is passed through the cystic duct one-third of an inch beyond the clamp—*i. e.*, between the clamp and the common duct. The viscera are protected with gauze and the cystic duct is cut between clamp and ligature. The spurting cystic artery is caught and ligated. If the cystic duct is not patent it should be split up till bile flows from it, even if the incision is carried into the common duct. Any calculi there are removed and the ducts, if incised, are sutured, the cystic duct longitudinally, the common duct longitudinally or transversely if its lumen would be too much narrowed by a longitudinal suture. The cystic gut is next ligated and this ligature, together with the traction thread, passed through the cystic duct is left long and brought out of the wound. A small cigarette drain leads to the stump of the cystic duct. The liver

[1] Annals of Surgery, 1904, vol. xl. p. 79

is not sutured. The cross-bar of the table is lowered while the depths of the wound are exposed. The peritoneum and deep fascia are sutured and the skin approximated with sterile plaster. Lilienthal drained the ducts in only two of his 42 cases.

Transduodenal Choledochotomy. Kraske[1] says that he has had little success in trying to loosen a gallstone impacted in the lower end of the common duct so as to push it back into the more accessible upper portion of this duct. He prefers rather to draw the duodenum to the left and to cut down directly upon the stone. Yet this entails a serious risk if the stone lies in the diverticulum, for then the pancreatic juice may escape through the incision in the duct, erode the tissues, and kill the patient. This happened to one of his patients so that he now prefers to open the duodenum and incise upon the stone from within the duodenum if the stone is impacted in the papilla.

Kehr[2] has performed this last-mentioned operation twenty times with two deaths. He places great stress upon a careful suture and correct after-treatment (rectal feeding, etc.). Later he reported[3] 3 additional cases of transduodenal choledochotomy with a new step in technique which he calls sweeping out the common duct (choledochusfege). The operative steps in these cases were cystectomy, cysticotomy, incision of the supraduodenal portion of the common duct, duodenotomy, papillotomy, sweeping the common duct, drainage of the common duct, drainage of the hepatic duct. Time required, one hour to one hour and a half. After the duodenum and papilli were incised the stone or stones were extracted with forceps, and a fine clamp was passed from the duodenum through the common duct. Its jaws were then separated to seize a piece of gauze. This was withdrawn into the duodenum, sweeping out a number of small calculi which could not be seized by the forceps.

Removal of Gall-bladder for Chronic Empyema. Mellish[4] removed a cystic tumor containing pus situated retroperitoneally below the liver, and found on opening the cyst that it was a much thickened gall-bladder containing pus and two gallstones. The circumference of the mass was 35 cm. (fourteen inches). The patient had first noticed this tumor thirteen years previous after an attack of "peritonitis." After recovery from that attack the tumor never disappeared, but it gave her very little trouble.

Development of Carcinoma of the Gall-bladder. Knaggs[5] drained the gall-bladder of a woman aged sixty-nine after removing a calculus which was impacted in the cystic duct. The fistula became very small but did not entirely close for many months. When it did close the patient

[1] Centralblatt für Chirurgie, 1904, Beilage p. 105.
[2] Loc. cit., p. 107.
[3] Centralblatt für Chirurgie, 1904, p. 833.
[4] Annals of Surgery, 1904, vol. xxxix. p. 570.
[5] Lancet, 1904, i. p. 1054.

experienced so much pain that the gall-bladder was again opened and its mucous membrane stitched to the skin. After a few weeks of irregular fever the patient died. The gall-bladder was the seat of malignant disease, and there was a marked suppurative cholangitis of the liver. No other gallstones were found. The interest in the case lies in the fact that at the first operation seventeen months before death the gall-bladder and common and cystic ducts were palpated and no evidence of malignant disease was noticed. The previous attacks of pain from which the patient had suffered had not been accompanied by jaundice.

Results of Gallstone Operations. The fate of the stump of the cystic duct after cholecystectomy has occasioned some dispute. Some experi-

FIG. 45.

Biliary passages of a dog, six months after ligation of the cystic duct close to the gall-bladder; gall-bladder removed. The cystic duct has dilated to form another gall-bladder. (HABERER and CLAIRMONT.)

menters have claimed that a new gall-bladder may be formed from it, and others have stated that such a transformation is impossible. There have been few autopsy records to settle the question so far as man is concerned; but Haberer and Clairmont[1] seem to have definitely established the fate of the stump of the cystic duct in animals by an elaborate series of experiments performed upon dogs and cats. They found that a cystic duct ligated close to the gall-bladder may so dilate that one can with propriety speak of the formation of a new gall-bladder, since the dilated structure has all the features, muscular and mucous of the old bladder (Fig. 45). If the cystic duct be ligated, not at the gall-bladder,

[1] Arch. klin. Chir., 1904, vol lxxiii. p. 679.

but near its termination in the common duct, such dilatation is impossible. The practical lesson is therefore that in performing cholecystectomy the surgeon should remove with the gall-bladder as much of the cystic duct as possible in order to prevent the formation of a new gall-bladder and the possible recurrence of the gallstones. There is abundant clinical testimony to the fact that gallstones do not usually recur after operation. Kehr says that the recurrence of pain after cholecystectomy is to be attributed to the pulling upon adhesions, to intestinal kinks, to abdominal hernia, or to conditions like enteroptosis or wandering kidney which existed prior to the operation.

Eugene Smith[1] found drainage of the gall-bladder a necessary sequel to operation in 90 per cent. of his 31 cases. Formerly gallstones were considered the cause of inflammatory troubles of the biliary tract, just as fecal concretions were formerly considered the cause of appendicitis. It is now well known that the concretions and the gallstones are the result of infection of the passages in which they are found. If cholecystitis is treated by early operation and drainage the infectious material can find its way outward, and the patient is saved the formation of gallstones, or other possibly more serious results, such as destruction of the gall-bladder, peritonitis, adhesions with neighboring organs, and interference with their functions (especially true of the pancreas), perforation of the gall-bladder, suppurative cholangitis or hepatic abscess. Cholecystostomy is the natural and easy method to drain the gall-bladder. If the cystic duct is constricted, or the gall-bladder is much distorted or has undergone malignant degeneration, cystectomy should be performed, accompanied by drainage of the cystic or common duct. This drainage may be omitted if there is a history of painful attacks due to stones but not accompanied with fever, and if at operation there is found neither marked infection of the biliary tract nor obstructive jaundice. Anastomosis between the gall-bladder and the intestine is permissible in cases of irreparable stricture of the common duct, or obstruction of the same due to malignant disease.

Intrahepatic Calculi. It is well known that Kehr is an earnest advocate of hepatic drainage after removal of the gall-bladder and incision of the common duct for calculi. He found that in no less than 17 per cent. of such cases there were some small calculi present in the discharge after what seemed at the time a perfect operation. He believes, therefore, that it is unwise to close the common duct and thereby to run the risk of retention of the calculi within the liver. Beer[2] has been investigating this question in the pathological laboratory, and finds good ground to endorse Kehr's clinical opinion. He selected 250 livers and

[1] Journal of the American Medical Association, 1904, vol. xliii. p. 1492

[2] Arch. klin. Chir., 1904, vol. lxxiv. p. 115.

examined them with reference to the presence of calculi. Although 72 of the gall-bladders contained calculi, calculi were found in the liver only six times. In 5 of these cases there was present at the time a closure of the common duct associated with cholangitis, and in the other case there was evidence of previous closure of an inflammatory nature. In 4 cases in which the common duct was closed by a tumor, there was accompanying cholangitis but no intrahepatic calculi. Beer therefore concludes that three factors are essential for the production of intrahepatic calculi: 1. Obstruction. 2. Cholangitis. 3. An unknown additional cause, since in the cases of obstruction due to tumor there was cholangitis but no calculi.

The rule should therefore be to drain the hepatic duct in all cases of calculi of the common duct when cholangitis exists. It should also be drained if the history of the patient shows that there have been attacks of cholangitis even if the bile at the time of operation is clear. For clear bile is not incompatible with cholangitis. Operation should not be delayed more than two months after the diagnosis is established of obstruction of the common duct due to stone. By adopting this plan one may occasionally find that the stone has passed into the duodenum, but early operation will save many patients from the serious effects of cholangitis.

Late Results of Operation. Kehr[1] has recently published the condition of 350 patients operated upon by him for gallstones. 1. In 9 of these patients it was not possible to remove all the calculi. Three of these passed the calculi spontaneously and had no further symptoms. One was re-operated upon and the calculus removed. 2. One patient had at the time of report a mucous fistula; 1 a biliary fistula. 3. Eleven patients suffered from hernia—3 per cent.

In all of these cases the wound was left wide open and tamponed on account of suppuration. 4. Twelve patients suffered from colic due to adhesions; 5 from colic due to inflammation. This leaves 311 patients who reported themselves as quite well, or 89 per cent. This showing is even more favorable than the report Kehr made upon his first 400 operations for gallstones in 1900. In his total experience with 900 patients he has never seen a true recurrence of gallstones after operation.

Hepato-cholangio-enterostomy. Kehr[2] resected the gall-bladder of a woman whose common duct was surrounded by dense adhesions so that the bile flowed neither into the intestine nor into the gall-bladder. A mucous fistula and jaundice persisted, and five weeks later he exposed the lower edge of the liver and excised from it an elliptical piece 6 by 3

[1] Münch. med. Wochenschr., 1904, vol. li. p. 602.
[2] Centralblatt für Chirurgie, 1904, p. 185

cm. (2.5 x 1 inch). Bile flowed from the opened bile-ducts. The duodenum was opened, applied and sutured to the wound in the liver. The wound healed well and the patient left the hospital in a month much improved and with less jaundice. Unfortunately no mention is made of the subsequent condition so that the ultimate effect of the operation is uncertain.

From experiments upon animals carried out by Enderlen and Tumstein[1] it seems extremely doubtful whether such an anastomosis can be established unless the operator is fortunate enough to open a large bile-duct. They found that the wound in the liver substance, exposed as it must be to the contents of the intestine with which anastomosis is made, became covered with a foul slough in three days. This gradually cleared away and repair of the wound took place. The deeper part filled up with granulations from the liver, while the intestinal epithelium covered the superficial wound. In this manner biliary discharge was completely prevented. These investigators do not therefore regard the operation as one of any possible utility, and Kehr himself says that should the occasion for it again arise he would prefer permanent external drainage of the biliary hepatic ducts—cholangiostomy.

THE PANCREAS.

Operation at an Early Stage of Pancreatitis. Bardenheuer[2] reports two operations for pancreatic disease. If the diagnosis in these cases is a little uncertain it is because the patients were operated upon before the lesions were well advanced. For this reason the cases are worth study. The first case is as follows: A man, aged forty years, healthy, fell and struck his right side against a sharp corner. He continued working for ten days, and then gave up on account of pain in the epigastric region, extending to the right shoulder. There was no vomiting, but diarrhœa and loss of weight. The stools contained undigested muscle fibres and fat. There was no sugar in the urine. Pressure below the liver gave an indistinct sense of resistance. As these symptoms continued, an exploratory incision was made ten weeks after the accident. The hepatic flexure of the colon was attached to the liver by light adhesions, while the adhesions between its under surface and the duodenum and pancreas were very firm. The stomach and upper part of the duodenum were much dilated. The head of the pancreas was enlarged, engorged with blood, and felt harder than normal. The remainder of the organ was atrophied. The gall-bladder was not altered. This seemed to be a case of pancreatic hemorrhage or at least interstitial pancreatitis fol-

[1] Mitt. Grenzgeb. med. Chir., 1904, vol. xiv. p. 104.
[2] Arch. klin. Chir., 1904, vol. lxxiv. p. 153.

lowing a comparatively slight accident. The adhesions were freed and gastroenterostomy performed. The patient entirely recovered.

In the second case a fat man, aged forty-four years, a heavy drinker, suffered from attacks of epigastric pain and vomiting beginning six months after infection with syphilis. Antisyphilitic treatment gave no relief from these painful attacks, which were similar in character to attacks of gallstone colic. There was obstinate constipation. There was indefinite resistance in the mesogastric region. A median incision revealed a fluctuating tumor behind the stomach and gastrocolic ligament. There was no fat necrosis in the peritoneum. The membrane was torn through and a great quantity of fresh and old blood escaped. The pancreas felt rough and necrotic in places, but it could not be brought into view. The cavity was drained, and discharged for a time only bloody fluid. In three weeks sugar and steapsin were demonstrated in the discharge, and in four weeks also trypsin. As the discharge continued free and the sinus showed no sign of closing, the pancreas was exposed through a left lumbar incision and separated from the sinus of the first incision, and the pancreatic attachment was ligated and cauterized. The sinuses were entirely closed in three months and the recovery of health was perfect.

Bardenheuer considers this second case one of acute pancreatitis with hemorrhage into the pancreas, which was very likely diseased before the hemorrhage occurred. The atrophy was secondary to the hemorrhage. It is thus seen that an early incision in such obscure cases may serve not merely to define the diagnosis, but to save the patient from the consequences of lesions, that without such intervention generally prove fatal.

THE SPLEEN.

Rupture of the Spleen. Gerrard[1] mentions an instance of rupture of the spleen recovering under medical treatment. A Chinese boy aged fourteen years was run over by a four-wheeled carriage, the wheel passing across the lower portion of the chest. The symptoms were hæmoptysis and frothy expectoration and rapid and feeble pulse and respiration and shock. There was dulness in the lower portion of the left chest and in both flanks. The conditions were not favorable to laparotomy, and the patient was therefore given ♏ x of the liquid extract of ergot and ♏ x of the tincture of opium every hour until plainly under the influence of the opium, while iced compresses were applied to the left side of the chest and abdomen. A saline enema of 8 ounces was administered every hour. Fluid by mouth was given for the first time four

[1] Dublin Journal of Medical Sciences, 1904, vol. cxvii. p. 425.

and a half hours after the accident. The patient made a good recovery. The dulness in the right side of the abdomen disappeared in five days; the area of splenic dulness was still enlarged when the patient left the hospital, twenty-four days after the accident.

Some surgeons are inclined to question the diagnosis when a patient recovers from a severe abdominal injury without operation. This is hardly fair if the symptoms are in accord with the diagnosis. It is unfortunate that Gerrard did not publish a record of the pulse-rate for the forty-eight hours following the rupture.

Splenectomy for Splenic Anæmia. Carstens[1] reports the removal of a spleen, weighing fourteen pounds, for splenic anæmia. The blood count showed 3,800,000 red and 1250 white cells. There was considerable loss of blood at the operation, and recovery was delayed by delirium, and the bursting open of the cicatrix necessitating a second irrigation of the abdomen and resuture. The patient left the hospital weighing ninety-seven pounds. Eight months later he weighed one hundred and ninety-three pounds, and his blood count gave 5,448,000 red and 9250 white cells. He was in perfect health except a small ventral hernia.

[1] Journal of the American Medical Association, 1904, vol. xliii. p. 980.

GYNECOLOGY.

By JOHN G. CLARK, M.D.

Cancer of the Uterus. All who have been actively engaged in gynecological surgery have passed through stages of enthusiastic hope, but in the end have been disappointed in the ultimate results from hysterectomy for cancer of the uterus, and several prominent gynecologists have fallen into a state of the direst pessimism so far as the cure of this disease is concerned. While the operative statistics up to this time must dampen the enthusiasm of even the most optimistic surgeon, they are, nevertheless, sufficiently encouraging to cheer the pessimist if the ultimate results are given an unprejudiced, critical review.

In the experience of all who have suggested or adopted the more radical methods of operation for cancer of the uterus, the analogy between cancer of the breast, with its axillary glands, and the uterus, with its iliac glands, appeared to be so self-evident as to lead to the rational conclusion that if the more radical operation for cancer of the breast gave better ultimate results, quite naturally the execution of this principle in cancer of the uterus would likewise improve the curative statistics. My experience has extended over ten years' observation of these cases, and while it has not been as extensive as that of Wertheim, of Vienna, it has been sufficient to rob me of the stimulating hope that by carrying out the most radical measures the patient may be afforded a greater chance for escape from her direful fate. While formerly I urgently advocated removal of the glands adjacent to the uterus, my principle at present is to remove all local tissue as far as possible without reference to the iliac glands, for, as my experience demonstrates, and is further sustained by other statistics, our patients die from local continuance of the growth rather than from widespread glandular metastasis. Therefore, the widest local operation without consideration of glandular metastasis is advisable; for if the glands are involved, recurrence, in my opinion, is unavoidable, regardless of the most radical measures. No one man's experience is sufficient to answer any question pertaining to the cure of cancer, and therefore the safest conclusion may be reached from a collective statistical study.

A very pertinent question in this study is: Does cancer give early metastasis? In answer we have various and very divergent opinions.

Riess, who was the first to advocate a radical operation with a view to the extirpation of the pelvic lymph glands, still holds very tenaciously to the opinion that metastasis occurs very early, and has consistently adhered to the most radical principles in his operations. Cullen was one of the first investigators to go on record against this theory, for in only a small proportion of cases did he find involvement of the pelvic lymph glands. Ten years have passed since these statements were first made, and sufficient material is now at hand to reach a more accurate conclusion.

As the result of Cullen's work he made the following statement: "As a matter of fact, the glands are not often involved; at any rate, only very rarely before the disease has advanced so far that the case has become inoperable." And, further, relative to cancer of the body, he says: "It may be safely said that in nearly all operable cases of adenocarcinoma of the body no glandular involvement has taken place." Cullen's views fully coincide with those of Winter,[1] who found the glands involved in only two cases in forty-four autopsies on patients where the disease was still confined to the uterus.

With the statements of Winter and Cullen before us the necessity for the radical removal of the glands, especially as this extra step prolongs the operation very materially and adds greatly to the dangers of shock, sepsis, and renal and ureteral complications, seemed much less urgent. Nevertheless, my own policy until the last four years has been in favor of the radical operation with extirpation of adjacent glands. Of late, however, as I have frequently stated, I consider the removal of the glands of prognostic rather than of curative value. As in many of the practical fields of surgery, so here, the radical operation was more or less extensively modified, and Werder, of Pittsburg, antedated Wertheim in the proposal of a radical operation which possessed advantages over the methods employed by Riess and myself.

The statements of Cullen[2] and Winter were quickly challenged by Peiser, Wertheim, Riess, and others, Wertheim claiming that metastases had been overlooked by these observers because serial sections had not been studied. Thus, Peiser in a considerable number of autopsy cases found the glands involved in 50 per cent. Wertheim, after perfecting his operation, reported 60 cases in 1901, and as a result of careful serial sections of the glands removed he found 31.7 per cent. of all cases involved, and in 15 per cent. of the earliest cases there were demonstrable metastases. He, therefore, found a much larger percentage than either Winter or Cullen, and thus justified the trial of the more radical operation.

[1] Zeit. f. Geburt. u. Gynäk., Bd. xxvii. S. 101.
[2] Münch. med. Wochenschrift, Bd. xvii. H. 28.

Schauta,[1] of Vienna, has had a very large experience with vaginal hysterectomy, and has recently considered the question of glandular metastasis in cancer of the uterus most thoroughly, and has furnished data which strongly sustains his plea for a radical local operation rather than a widespread search for glandular metastasis. He, therefore, takes strong issue with Wertheim. In this study of 60 cases which died either as the result of operation or from the natural effects of the disease, each case has been thoroughly studied to determine the frequency of glandular metastasis, and the relationship of the pelvic to the higher retroperitoneal lymph glands.

In order to study the glandular areas according to topographical localities, he divides them as follows: 1. The sacral glands, which are found on the anterior surface of the sacrum and in the mesorectum. 2 The iliac glands, which are situated in the triangle between the external and internal iliac vessels; also along the course of the common iliac vessels. These two groups of glands he looks upon as being operable areas, in that they may be reached during the course of hysterectomy.

The glands which cannot be reached by an operation are: 1. Those situated along the sides of the aorta, from its bifurcation to the renal vessels. 2. The cœliac glands, which are situated between the renal vessels and the diaphragm. 3. The superficial inguinal glands. 4. The deep inguinal glands. While the inguinal glands are unquestionably operable, they are comparatively seldom involved in cancer of the cervix. Therefore, they need not be seriously taken into consideration in the more radical methods of operation.

In Schauta's series of 60 cases death followed operation in 11, 9 died of intercurrent affections, and 40 from the natural termination of the disease. In considering the question of operation in these cases from the standpoint of glandular metastasis, Schauta divides them into the following groups: Group 1, both the lower and upper series of glands free of disease in 26 cases, 43.3 per cent.; Group 2, the lower pelvic glands carcinomatous, while the upper glands were free in 8 cases, 13.3 per cent.; Group 3, the lower glands free, but the upper the seat of metastasis in 5 cases, 8.3 per cent.; Group 4, both the upper and lower series of glands involved in 21 cases, 35 per cent. From this study of cases it is evident that there were 48.5 per cent. of cases in which the lower glands were carcinomatous, but only 13.3 per cent. could have been saved by the most radical operation, for in the remainder the upper series of glands which could not have been removed were involved.

It is also a rather surprising observation that notwithstanding the majority of these patients died from the natural termination of the dis-

[1] Monat. f. Geburt. u. Gynäk., 1904, Bd. xix. Heft 4.

ease, 43.3 per cent. were entirely free of carcinomatous metastasis. In my opinion, it is this class of cases with which we must definitely reckon in considering the permanent cures following hysterectomy for cancer.

Relative to the time of metastasis, all observers recently have agreed that the extent of the disease furnishes no criterion as to the presence or the extent of the metastasis. Also another fact which has been prominently brought into the foreground, especially by Schauta, Kundrat, and others is that the size of the gland is of no clinical value in deciding whether it is the seat of cancer. In this series of Schauta's cases notwithstanding the majority of his patients died from the disease without operative intervention, in almost one-half the cases the cancer was still a local disease. Certainly as yet no one has satisfactorily explained the peculiarities of metastasis in these cases; why a cancer which is only starting upon one lip of the cervix should give a metastasis and another case of the most advanced involvement should be free from this complication. Another peculiarity of glandular metastasis is that a lymph gland may be greatly enlarged and may be palpated as a well-defined mass, and yet is not necessarily the seat of carcinoma, while a small adjacent gland is found on microscopic examination to be the lodging place for cancer cells. Relative to this question of lymphatic involvement, Schauta, Kroenig, and others are skeptical as to whether malignant cells always continue to develop after they are lodged in the lymph glands. They believe that in a certain proportion of cases they do not grow, but are either retained in the lymph glands as foreign bodies or undergo degeneration and are destroyed.

From these observations it would seem that the prolongation of a radical operation, with its attendant higher mortality, may not be justifiable. This would seem to be especially true if in general Schauta's observations were to prove true, that in only 13.3 per cent. of cases is the metastasis localized solely to the pelvic areas, which might be totally extirpated. Then, too, a point which has frequently been noted of late is that the glands alone are not the sole nesting places for the cancer cells, for the lymph vessels and adjacent connective tissue in many instances have been involved.

With these observations before us the outlook for the improvement in the mortality rate following a more radical operation with the extirpation of the lymph glands is, to say the least, discouraging. While we may consider these statistics of Schauta's as coming from an operator who is prejudiced in favor of vaginal hysterectomy, we do not find much to offset his conclusions in the work of Wertheim and his assistant, Kundrat. As a result of Schauta's study he comes to the following conclusions: 1. In cases of uterine cancer in which the operable group of glands is involved it is probable that the higher situated glands are like-

wise invaded, thus making a radical operation impossible. 2. Large, hard, infiltrated glands are frequently not cancerous. 3. Even the smallest glands may be cancerous. 4. Cancer may not strictly be confined to the glands, but is found in lymph spaces, connective tissue, or in veins between the glands.

In Wertheim's last report of cases I am inclined to feel that he has not sustained his position; on the contrary, I believe he has confirmed the statistics of his opponents.

From an analysis of Wertheim's 80 cases it will be seen that in 54 cases the lymph glands were not involved, and therefore the radical operation did not increase the prospects of permanent cure, while the same procedure certainly was attended with much greater dangers of immediate mortality. If to the remaining 26 cases we were to apply the results of Schauta's research, only 13 per cent. were operable from the radical standpoint; for if his observations are correct, in only this small percentage was the metastasis located solely in the pelvic glands accessible to the radical operation.

That Wertheim is laying less stress upon the extirpation of the gland is, I believe, shown in two paragraphs in his report of 1901. He says:

1. It is an error to consider that the chief stress is laid upon the extirpation of the glands. Just as important, indeed more important, is the widest possible removal of the parametrium. 2. According to his latest observation it is not necessary to remove the glands if they are not enlarged.

Contrary to Wertheim's conclusions upon this last point, Oehlecker, v. Rosthorn, Kroemer, Cullen, Sampson, and others claim that the size of the gland bears no relationship to metastasis, for large beaded glands may contain no trace of cancer cells, whereas in the immediate vicinity a very small gland may contain many epithelial cells. Thus, Wertheim's latest statement, that unless the glands are palpably enlarged they need not be extirpated, is based upon a fallacy and cannot be maintained; for if, as now appears certain, the foregoing observers are correct, the entire force of Wertheim's argument in favor of the removal of the glands falls to the ground, and if the last principles are followed we shall never be able to determine how much the removal of the glands has increased the ultimate recoveries. Certainly, a considerable number of cases in which no palpable glands are found will still be the seat of more or less metastasis. If the principle of glandular extirpation is to be of avail, then it must be systematically carried out in all cases, whether the glands are palpable or not. As I view this question, I believe that Wertheim's cases sustain rather than disprove Schauta's argument. From the study of Wertheim's operative cases we find that in 67.5 per cent. the lymph glands were not involved. In Schauta's series, largely

of cases dying from the natural results of the disease, 43.3 per cent. were free of glandular metastasis.

When we take into consideration the fact that there is no regularity of metastatic distribution, that the earliest cases may have already given metastasis, that when the lower accessible glands are involved, the upper inaccessible glands, with the exception of only 13 per cent., are also involved, little argument is left in favor of the removal of the glands, with the largely added mortality that must necessarily follow this step from shock, infection, and other complications. My own conclusion, therefore, although very reluctantly reached, is that we lose more than we gain in the radical operation when the glands are painstakingly extirpated, and to remove here and there a palpably enlarged gland will certainly not promote the patient's interest so far as a radical cure is concerned. My own rule, therefore, is to remove one or more glands, if they are palpably enlarged, for microscopic examination. If metastasis is found, the prognosis is inevitably bad. If we are not to look for improvement in ultimate results from the radical operation with the removal of the glands, from what operative precedure may we gain the greatest good? Shall it be a high amputation of the cervix, a simple vaginal hysterectomy, a Schuchart's vaginal hysterectomy facilitated by paravaginal incisions, or Wertheim's radical operation? Of these various methods I would discard all but the abdominal one. This I carry out most radically with the actual cautery, so far as the vagina and parametrium are concerned, and in this I revert to the principle so strongly insisted upon by Dr. Russell after his study of 48 vaginal hysterectomies. He found almost invariably that there were recurrences at the site of the operation scar, and not in more or less widely remote metastatic areas. The rule, therefore, to which I adhere, is to remove all possible tissue in the vicinity of the primary site of the growth, using the cautery rather than the knife. In general, the principles laid down in Wertheim's latest publication are followed, stopping short with the removal of a considerable cuff of vagina with the uterus, and as much parametrium as is possible, and not prolonging the operation by a search for glands. In acting upon this principle I am influenced by the fact that as yet no operation has saved 50 per cent. of cases, and that in Wertheim's operable cases 59 per cent. showed no glandular metastasis, while even in the far-advanced autopsy cases of Schauta there were 43 per cent. free of lymphatic involvement, and that of the remainder which were involved, only 13 per cent. could have had their chances for a more radical cure enhanced by a removal of the glands. This small percentage of possibility is at least equalized or more than offset by the much greater immediate mortality of the very radical operation.

C. P. Noble[1] reports his further experience with the *Downes electro-thermic clamp*. Up to the present time he has had 10 cases. In 7 of these the disease had extended beyond the confines of the cervix, and a number of them would have been inoperable by the ordinary means. The only objection to the operation is the frequency with which injury to the bladder or ureters occurs. In Noble's series there were such accidents in 5 cases. There is a great technical advantage in using these clamps, for it avoids annoying oozing and leaves a dry field to be covered in by the peritoneal flaps.

Olshausen, who for the last several years has been an advocate of vaginal hysterectomy for cancer of the cervix, has recently compared his statistics as to immediate mortality, and so far as possible as to recurrences with those of Wertheim and Zweifel.[2] In Zweifel's experience with 270 cases which represent 26.7 per cent. of all cases presenting themselves at the clinic for treatment, the primary mortality following vaginal hysterectomy was 5.45 per cent.; after the second year 44 per cent. were alive, and after the fifth year 35.6 per cent. However, as the end result of his statistics, there was only an absolute cure in 9.72 per cent. of the cases. Wertheim's operable cases numbered 120, or 40.3 per cent. of those presenting themselves at the clinic for treatment. His primary mortality was 20 per cent.; as yet none of his cases have passed the five-year period; so that it is impossible to say what his ultimate cures will be. Olshausen operated upon 671 cases by vaginal hysterectomy, and his percentage of operability was 31 to 44 per cent. Eighteen per cent. survived more than the five-year period.

Within the last decade the percentage of operability has increased from 31.6 to 61.6 per cent. The increase in the number of operable cases is unquestionably due to the continuous agitation in Germany, during the last few years, in favor of the early diagnosis and prompt operation in cases of cancer of the uterus.

Etiology of Carcinoma. The surgical aspect of the carcinoma problem is so unsatisfactory that the number of investigators endeavoring to discover the cause of carcinoma is on the increase. This activity is stimulated by the conclusion that if carcinoma is ever to be successfully treated it must be by some other means than that generally employed at present. Although its early recognition is a matter of the greatest importance from the surgical standpoint, there is still an urgent need for some more effective therapeutic measure to cope with it successfully. When once the origin of carcinoma is settled, then the solution of its therapeusis may be easier.

[1] Journal of the American Medical Association, vol. xliii. No. 19.
[2] Zeit. f. Geburt. u. Gynäk., 1903, Bd. l.

Plimmer[1] says the idea that carcinoma is an infectious disease is an old one. After the development of bacteriology the manifest difference between carcinoma and the diseases well established as infectious gave rise to the theory that carcinoma was due to an animal parasite or protozoan instead of a vegetable organism. There are a number of reasons for suspecting an infectious origin of this disease. Among these are: an apparent increase of cancer in certain districts, its prevalence in certain houses, and in low-lying, damp, and wooded districts.

In this connection Behla's story of the village of Luckau is most interesting (quoted by Plimmer). Luckau has a population of 5000 inhabitants, most of whom are tillers of the soil. The population remained practically stationary between the years of 1875 and 1898. The village consists of a main central part, and an eastern and western part. There are 3000 people living in the central town, 1000 in the eastern, and 1000 in the western. The houses throughout the village are of the same simple construction, but the soil of the central and eastern town is low and damp, while that of the western is high and sandy. A large drainage canal filled with stagnant water encircles the central and eastern town, but does not touch the western. The deaths from cancer between the years mentioned numbered 1 out of 25 or 30 for the entire town, and 1 out of 9 for the eastern town. The cases in the central town occurred mainly in houses bordering along the canal, the water of which was used by the inhabitants to water their vegetables, many of which were eaten raw. There were 127 houses in this quarter, and 56 contained patients suffering with cancer; 43 of them had 1 case each; 10 had 2 cases each; 2 had 3 cases each; and 1 had 4 cases. Behla believes the source of the infection was in the uncooked vegetables.

Confirmatory of this theory Lyon found twice as many cases of carcinoma in the German as in the native wards of the city of Buffalo, and says that most of the Germans raise their own vegetables, many of which are eaten uncooked.

Foucalt[2] describes the town of Fontainebleu, which is surrounded by a large forest, and says that the death-rate from carcinoma in the past forty years has been 7 per cent. of the total deaths. The cancer houses were invariably badly ventilated, with little or no exposure to sunlight, and were situated in the lower and damper parts of the town.

These statements are certainly striking, but they cannot be convincing in the light of other investigations. In last year's PROGRESSIVE MEDICINE I quoted Bollinger's statistics for Münich; this author gave theoretic reasons for the increase in carcinoma, but showed that it was

[1] British Medical Journal, December 5, 1903.
[2] Bulletin de l'Académie de médecine, lxviii. No. 22.

more apparent than real. Hoeber[1] presents a comprehensive study of the conditions which accompany cancer in the city of Augsburg, Germany. The city has a population of 84,097; the average death-rate is 27.74 per 1000, and 5.5 per cent. of these are due to new-growths. He tabulates the statistics for the years 1892–1901, inclusive. It is noticeable that in 1892 there were 1.1 in 1000 inhabitants who died of new-growths; in 1901 this had reached 1.3 per 1000 inhabitants—an insignificant variation. During the same period, among 100 deaths 3.8 died from new-growths in 1892, and 6.5 in 1901. But in 1894 the proportion of those dying from new-growths was 6; so that the increase from 1892 to 1901 is not really the difference between 3.9 and 6.5. In fact, between 1894 and 1901 the proportion had diminished, the average for the entire ten years being 5.5 per cent. Among 775 houses where carcinoma occurred, in 663 there was 1 case, in 100 there were 2 cases, in 6 there were 3 cases, and in 6 there were 4 cases. Hoeber's paper is accompanied by maps showing the location of the cancer houses, the soil, and the geological foundation. He was unable to discover any relation whatever between the location of the cancer houses and the soil, drainage, elevation, etc. The disease was most prevalent in the poorer quarters.

Two years ago I gave Israel's views upon the origin of cancer; he believed constant irritation so encouraged the proliferation of epithelium that it might, in time, penetrate the connective tissue. Plimmer, however, calls attention to the normal hypertrophy of epithelium, as seen upon the hands and feet in corns and bunions. They are the direct result of mechanical irritation and yet they never produce carcinoma, and when the source of irritation is removed the hypertrophy disappears. He quotes von Hansemann, who says that an irritation affecting a normal cell produces hyperplasia, while if it affect an anaplastic cell—*i. e.*, one which for some reason has become essentially altered so that it grows like an embryonal cell—carcinoma results. Plimmer believes the cause of this anaplasia of the cell and the source of its growth is dependent upon a parasite. In applying this theory he finds an explanation for the fact that not all metastatic carcinoma cells give rise to secondary growths. If the metastatic carcinoma cell is not the seat of an organism the cell dies; if an organism is present it grows. He believes that the prevalence of carcinoma on the exposed and unclean parts of the body favors the theory of cancer parasites. In several cases of epithelioma of the lip which he observed, soap had not been used for years. As a further instance of its infectious character, he calls attention to its local transplantation from the upper to the lower lip, and from one

[1] Zeit. f. Krebsforschung, 1904, Bd. i.

labium to another. He also mentions Harrison Cripp's case of transplantation from an ulcerating breast to the skin of the arm. Behla has found nineteen well-attested cases of "cancer a deux"—that is, cancer occurring in people who are living together.

Much is made of the fact that cancer cannot be inoculated from man to animal; but this is also true of such infectious diseases as leprosy and the exanthemata. Moreover, there is a disease of plants, Kohlhernie, caused by the *Plasmodophora brassicæ*, which has been compared to carcinoma, and can only be inoculated upon a plant of the same species.

There is no longer any doubt that carcinoma can be inoculated from one animal to another of the same species. Jensen[1] has recently had 40 to 50 per cent. of successful results in the inoculation of mice from one animal to the other. The same inoculations into other animals were negative. Although Jensen himself regards these simply as instances of implantation growths, Plimmer believes they are evidences of infection, because ordinary epithelium transplanted to another animal may grow for a while, but invariably is destroyed by phagocytosis.

Orth[2] says that up to the present time: 1. That no one has produced proof that carcinoma is of parasitic origin. 2. There is no necessity to assume a parasitic etiology for carcinoma. The transplantation experiments he regards as no proof whatever of infection. Transplanted periosteum, he says, will grow and produce cartilage and bone, and epidermal scales are frequently successfully transplanted. Orth finds the weakness of the parasitic theory in this: that in order for a growth to be produced some of the cancer cells have to be transplanted. *He does not consider it impossible that an intracellular organism may play a part, but he thinks it impossible that it plays an independent part.* If it were possible to produce tuberculosis only through the transplantation of tuberculous tissue, then the tubercle bacillus would never certainly have been proved as the etiological factor. It is only through the production of a primary cancer from a pure culture of an organism that its bacteriological origin can be demonstrated.

Morris[3] makes practically the same statement, and draws attention to the fact that all the granulomata (inflammatory tumors) produced by organisms maintain a uniformly identical structure in whatever part or tissue it may arise. If this same rule obtained in carcinoma, in case it is infectious, then we should have to imagine a different organism for each variety of carcinoma.

Morris believes in the inclusion theory of Cohnheim, as elaborated and modified by Durante, Nicoladoni, Ribbert, and Senn. This pre-

[1] Centralblatt f. Bakt., June, 1903.
[2] Annals of Surgery, December, 1904.
[3] British Medical Journal, December 5, 1903.

supposes the existence of congenital matrices of embryonal cells and the existence of postnatal matrices. It also allows for the continuance of these matrices in a dormant state for a time until they are aroused into activity by sources of irritation. It goes without saying that these hypotheses account for a large number of benign tumors. The question is, Does it obtain in malignant growths? Several facts seem to indicate that it does. For example, carcinoma is quite frequent in those parts where embryonal inclusions are found. As instances of this Morris notes sarcoma and epithelioma of the upper jaw and mandible, and carcinoma of the uterus, œsophagus, rectum, tongue, and mouth. The common occurrence of carcinoma of the lip along the line of juncture between the mucous membrane and the skin, as well as the site of carcinoma of the rectum, frequently corresponding to the line of union between the cloaca and the hind gut, is very significant from an embryological standpoint. Benign growths may become transformed into malignant ones, as instanced by warts, moles, papillomata, etc. It may also be true that in the process of growth of the benign tumor some of the daughter-cells may fail to attain the degree of differentiation that the parent cell attained, and may subsequently develop on their own account into a malignant neoplasm.

It is but natural when such arguments are brought to bear for and against the parasitic theory of carcinoma, or at least for the participation of parasites in the production of new-growths, that we are attentive to an entirely new hypothesis, which reconciles some of the doubtful points on both sides. Kelling,[1] of Dresden, denies the possibility of the production of cancer from already existing epithelium. To substantiate this he refers to the work of Petersen and Borrmann[2] and Pforringer.[3]

Ribbert's view, that carcinoma is a collection of embryonal cells, is sound; he believes, however, that these embryonal cells do not bear the relation of consanguinity or heredity to their host, but that they are distinctly foreign cells—introduced from without—and that their action may be compared to that of a parasite. He shows how frequently living embryonal cells gain entrance into the body, as, for example, from the eggs of fish, insects, etc., in drinking-water, or food, or from imperfectly cooked eggs, or from the bites of insects. In order to prove his hypothesis, he hatched a number of hens' eggs to a suitable stage, and then cut up and ground the embryos in a mortar. The embryonal cells were then suspended in physiological salt solution and injected into dogs. Only a part of an embryo was used in a single case.

[1] Münch. med. Wochenschrift, Bd. xi. H. 24.
[2] Verhandlung des XXXII. Chirurg. Kongres, 1903, S. 64 u. 71.
[3] Bruns' Beiträge z. klin. Chir., Bd. xli. S. 687.

Of 14 dogs thus inoculated, 7 were killed in the course of a few weeks and in 5 new-growths were found.

SUMMARY OF RESULTS.

I. Injection into testicle and femoral vein.
Result: Round-cell sarcoma of testicle.
Malignant adenoma of the liver.
II. Injection into vein of small intestine.
Result: Malignant adenoma of liver.
III., IV., V. Injection into liver or nearby vein.
Result: III. Spindle-cell sarcoma.
IV. Spindle-cell sarcoma.
V. Malignant alveolar tumor.

The author speaks of the possible objection to his findings on the ground that the tumors existed beforehand. All the animals, however, were carefully examined to detect the presence of any growth, and in three of them laparotomy was performed in making the injection, and the abdominal organs were thoroughly inspected. His article contains illustrations of microscopic sections of the new-growths, which appear to prove his assertions.

These experiments, he thinks, indicate the entire prophylaxis and therapy of malignant tumors, and he has already begun treatment along these lines. While he believes that aberrant embryonal cells may occasion a tumor of consanguinity, he is convinced that such tumors are always benign. It is the foreign embryonal cells which produce the malignant growths.

Other investigations bearing upon the etiology of carcinoma ma be noted. Wolff[1] calls attention to the frequency with which carcinoma attacks organs communicating more or less directly with the exterior, as the stomach and uterus. He also speaks of the prevalence of carcinoma in his neighborhood, where, in a population of 11,703, there were 159 cases of cancer in nine years.

Adams[2] calls attention to the few native-born Australians who have carcinoma, and believes that this is due to the prophylactic properties of the eucalyptus tree. He believes strongly in syphilis as a predisposing factor in cancer. Among Australians the number of deaths per 100,000 from carcinoma is 22.6, among British 203.1.

Newsholme[3] from an analysis of the statistics of the United Kingdom Temperance and General Provident Institution, finds a greater number of deaths from all causes and from cancer among non-abstainers.

In conclusion, it may be said that Monsarrat,[4] Feinberg,[5] and E. von

[1] Zeit. f. Krebsforschung, 1904, Bd. i.
[2] Lancet, February 13, 1904.
[3] British Medical Journal, December 12, 1903.
[4] Ibid., January 23, 1904.
[5] Wiener klin. Woch., Bd. xvi. H. 46.

Leyden[1] have recently described as parasites bodies which they have found in carcinoma cells. The organism Feinberg describes agrees with those found by Plimmer and von Leyden.

Early Diagnosis of Cancer. In last year's PROGRESSIVE MEDICINE I quoted a number of authors (Winter, Kelly, Anspach) who urged the necessity for the early recognition of carcinoma on the ground that it was only in incipient cases that there was much hope of cure. Winter set about in a practical way to secure this result by sending to all of the physicians and midwives in East Prussia circulars and pamphlets, calling their attention to the early symptoms of cancer and to the necessity for prompt intervention. He also had newspaper articles printed, impressing the laity with the seriousness of the disease, and the ease and frequency with which an early case might be overlooked. Recently Winter published the result of the first year of his crusade. He compares his statistics for the year 1903 with those of the four previous years, 1898–1902. His total number of cases for the year of which he has full knowledge is 84. The improvement may be shown in various tables:

I. Percentage of cases in which the necessity for an immediate gynecological examination was not recognized by the physicians:

1898 to 1902	14.2 per cent.
1903	11.0 "

A gain of 3.2 per cent.

II. Number of times currettings and cervical tissue were sent to laboratory for diagnosis:

1898 to 1902	14
1903	53

A gain of 39 cases.

III. Attitude of midwives: Of the 84 patients, 8 consulted midwives.

Not examined by them, but immediately referred to physicians	3
Examined by them, but then sent to physicians	3
Examined and treated by midwife	1
Details not known	1

There was but 1 case out of 7 in which the midwife was ignorant or dishonest. From 1898 to 1902 Winter has knowledge of 28 cases which fell into the hands of midwives, and 15 of these were expectantly treated.

IV. To show the effect upon the public mind. The interval of time between the patient's first observance of symptoms and the consultation of a physician:

	1898 to 1902, 234 women.	1903, 55 women.
Within one month	14 per cent.	22 per cent.
Longer than one month	18 "	35 "
Longer than three months	26 "	33 "
Longer than six months	12 "	5 "
Longer than nine months	18 "	5 "
Longer than one year	12 "	0 "

[1] Zeit. f. Krebsforschung, 1904, Bd. i.

V. Showing the time allowed to elapse between the advice for operation and the acceptance of that advice:

	1898 to 1902, 122 women.	1903, 60 women.
Eight days	63 per cent.	78 per cent.
Two weeks	15 "	12 "
Three weeks	3 "	0 "
Four weeks	3 "	5 "
Two months	4 "	3 "
Three months	5 "	0 "
Four months	2 "	2 "
Six months	2 "	0 "
One year	2.5 "	0 "
Over one year	0.5 "	0 "

In other words, 57 per cent. against 32 per cent. consulted their physician within the first three months, and 90 per cent. against 78 per cent. accepted advice for operation within fourteen days.

The most evident result of Winter's crusade would naturally appear in the percentage of operable cases. He says that there is some difficulty in estimating this because the question of operability rests largely upon the judgment of the individual operator.

VI. From Winter's own cases and those of others, it appears that the operable cases in his own hands numbered in—

1898 to 1902.	1903.
71 per cent.	82 per cent.

In the hands of others:

1898 to 1902.	1903.
52 per cent.	65 per cent.

Showing an average in increase of from 62 per cent. to 74 per cent.

To show the impression of Winter's crusade upon physicians it may be stated[1] that the obstetrical and gynecological societies of Dresden and Leipzig are sending duplicates of Winter's circulars to all the physicians in Saxony. The *Berliner klinische Wochenschrift* remarks, however, that the chief obstacle in this work is the activity of irregular practitioners and "herb women." If the crusade is to have any permanent value in some sections these charlatan practices must be regulated or abolished.

Wolf suggests as a further ensurance of the early treatment of cancer that a law shall be enacted making it compulsory to report all such cases to the health authorities.

Non-operative Treatment of Cancer. Because apparently hopeless cases of cancer are sometimes cured or relieved for periods of two to five years, Lomer[2] believes the economy is able, under certain circumstances, to successfully combat a new-growth. The fact that fever and infectious diseases and severe burns at times favorably influence the

[1] Journal of the American Medical Association, vol. xliii. No. 24.
[2] Zeit. f. Geburt. u. Gynäk., Bd. l. H. 2.

course of the disease seems to indicate that profound changes in the blood may have a direct antagonistic influence upon a cancerous growth.

Lomer is now experimenting with a view to the production of a serum which he hopes will have such an effect. The author has found 149 cases of carcinoma in the literature treated by electrocauterization or thermocauterization, in which there had been no recurrence for five years. As the result of this observation he would recommend:

1. Repeated cauterization of every suspicious area in the cicatrix after extirpation of operable carcinomata; frequent and systematic cauterization in inoperable cases.
2. Local applications of heat.
3. Exhibition of potassium chlorate and arsenic.
4. Regular irrigation of the vagina with potassium chlorate.
5. Injection of substances which produce fever—perhaps a culture of staphylococcus.

He recommends for investigation:

1. The action of epithelial serum and hæmolytic human serum upon visible carcinoma.
2. The existence of leukocytosis in carcinoma and whether this exists independent of ulceration.
3. The behavior of cancer subjects in regard to soluble bacterial toxins (tuberculin, staphylotoxin).
4. The reason for the small disposition of cancer subjects to contract infectious diseases, and whether this is due to histogenic, bactericidal, or antitoxic influences.
5. Whether there circulates in the blood of cancer subjects toxic substances which produce the cachexia (this would comprise a study of the isotoxins and of hæmolytic and agglutinating substances in comparison to the normal human blood).
6. Treatment of carcinoma patients with inorganic and organic blood poisons, potassium chlorate, arsenic, phenylene diamine, etc.
7. Extravascular resistance of the red blood corpuscles of carcinoma subjects to different blood poisons.

The treatment of carcinoma by means of the Finsen light, *x*-rays, and *radium* continues to be a favorite topic of discussion. Hopkins,[1] Turner,[2] MacIntyre,[3] Burns,[4] Tuffier,[5] Exner,[6] Lassar,[7] Apolant,[8] and others have made contributions, either from the clinical side or from

[1] Brooklyn Medical Journal, December, 1903.
[2] British Medical Journal, December 12, 1903.
[3] Ibid
[4] Therapie der Gegenwart, Berlin, Bd. xlv. No. 1.
[5] Presse médicale, vol. i., No. 10.
[6] Wiener klin. Wochenschrift, Bd. xvii. H. 13.
[7] Berliner klin. Wochenschrift, Bd. xli. H. 20.
[8] Deutsch. med. Wochenschrift, Bd. xxv. H. 31.

the purely scientific aspect in accounting for the action of radium on tissue.

Abbe[1] has written a paper on radium which gives us a detailed account of this interesting substance. Metallic radium has not yet been isolated, the substance on the market being a chloride of barium and radium. The strength of a given specimen is denoted by the time it requires to discharge a gold-leaf electroscope. The standard unit is the time required by metallic uranium for the same purpose. If the specimen of radium discharges the electroscope in one-thousandth the time required by uranium, the strength is represented by one thousand.

Specimens of high strength are generally used, anywhere from 200,000 to 300,000. Observations show that the radium rays do inhibit or diminish the growth of certain forms of bacteria, but, unfortunately, they are not without harmful effects, and like the *x*-rays may produce burns which appear several weeks after exposure, causing large ulcers which are difficult to heal. With regard to its therapeutic value, the radium rays are on a par with the *x*-rays. As stated in last year's PROGRESSIVE MEDICINE, the *x*-ray in some cases of carcinoma does good, but should never take the place of surgical intervention. Its employment is solely for those cases of recurrence of carcinoma or inoperable carcinoma in which the surer surgical intervention is no longer available.

The scientific explanation for the effect of radium rays on cancerous tissue has been discussed by Apolant, Exner, Neuberg,[2] and others. Apolant and Neuberg believe this action directly affects the cancer cells and that the increase of connective tissue is secondary. Neuberg believes the disintegration of the cell is due to a destruction of the enzymes which have to do with cell life, and a preservation and activity of the autolytic ferment. Exner believes the effect is primarily in the connective tissue, which grows and squeezes the epithelial cells out of existence. In his cases connective-tissue changes occurred in one week, but the effect upon the epithelial parts was only apparent after the fourteenth day.

In the treatment of inoperable cancer of the cervix, Martin[3] still believes in cauterization, and the old palliative operation repeated as often as required. Hegar[4] believes that possibly a medical cure for carcinoma will be found. Tuffier[5] does not believe in the value of any serum. They all do good for a time, but soon lose their effect.

Myoma Uteri. The two chief factors which mould the progressive surgeon's opinions are, first, his personal experience, and, second, the

[1] Editorial, Journal of the American Medical Association, vol. xlii. No. 13.
[2] Zeit. f. Krebsforschung, 1904, Bd. xi. p. 171.
[3] Therapie der Gegenwart, Bd. xiv. H. 6.
[4] Münch. med. Wochenschrift, Bd. li. H. 15.
[5] Presse médicale, i. 10.

influence made upon him by a close touch with the literature of his subject. The rule has long since been established that cancer should be operated upon as quickly as it is discovered, if it is still in an operable stage. This same rule obtains relative to ovarian cysts, for a vast majority of these tumors grow steadily, and sooner or later produce complications and ultimately cause the death of the patient. Therefore, from the clinical standpoint at least, all ovarian tumors of even moderate size are looked upon as being of sufficient gravity to require an operation. Until very recently no one has taken this position relative to fibroid tumors, for with few exceptions they are benign, and, as their clinical course has seemed to show, they may remain of moderate size, producing no symptoms whatever, and occasionally may disappear or atrophy after a puerperium or at the menopause. The constancy of these observations and the fact that such a considerable number of fibroid tumors are discovered at autopsy, which have never given rise to symptoms, has led to the conclusion that unless they are producing clinical symptoms or are rapidly growing, they should not be subjected to operative treatment. Certainly the various palliative methods of treatment are of practically no value, notwithstanding the favorable reports of electric and other therapeutic methods in diminishing the size, or causing the absorption of the tumor.

There is, therefore, but one of two positions to assume: either the operative or the tentative until symptoms develop. The latter plan of treatment unquestionably must depend upon the absence of the clinical symptoms, which will be enumerated further on in this review. Between the tentative or waiting policy and the operative treatment, in the larger majority of cases, the operation will sooner or later have to be instituted, and therefore the rather radical position taken by several recent writers that a tumor should be removed as quickly as it is discovered, has arguments in its favor, although the exceptions to the rule, in my opinion, are so numerous that were it generally adopted it would prove to be a too wholesale principle not to be commended. In the following pages I shall discuss the indications for operation as laid down by advocates of the more radical policy, and will summarize my own conclusions relative to the clinical aspect of the subject. A second point which will also fully be discussed is the type of operation most suitable for the removal of fibroid tumors.

Associated Diseases of the Uterine Appendages. Daniel,[1] as the result of a statistical study of the adnexa of fibroid uteri, has found in 59 per cent. pathological alterations. In about one-fourth of the cases there was catarrhal salpingitis, and in the remainder the tubes were

[1] Revue de gynéc. et de chir. abdom., 1903, 1 and 2; Referat: Zeit. f. Gynäk., 1904, Nr. 44.

mostly the seat of either chronic parenchymatous or suppurative salpingitis. Hydrosalpinx, hæmatosalpinx, tuberculosis of the tube, and tubal pregnancy were also encountered. The ovaries were frequently diseased, 40 per cent. of the cases showing pathological changes. The chief lesions were cystic degeneration, tumors, suppuration, and tuberculosis. The author attributes these changes to three causes: 1. Infection. 2. Fibromatous diathesis. 3. Direct action of the fibromyoma upon the adnexa, producing an obstruction in the tube and adhesive peritonitis, which may lead to the formation of a hydrosalpinx or hæmatosalpinx.

In spite of the frequent association of fibroid tumor and adnexal disease, the latter is often not recognized until operation or necropsy. One, therefore, should always bear this probability in mind when a patient who has a fibroid tumor complains of pain in the vaginal vault, for the tumor, unless subjected to pressure, does not cause this symptom. While pathological changes in the appendages may cause pain, it is also true that they may exist without this symptom. Daniel believes the sterility of fibroid patients is, as a rule, due to pathological changes in the tubes or ovaries.

Degenerations and Associated New-growths of Myoma Uteri. The question of the transformation of a fibroid tumor into a sarcoma is of great interest, because this malignant change above all others would be fatal if let alone. Henkel[1] believes it a great mistake to judge of the frequency of this transformation by sporadic cases. High percentages have been reported, but Henkel is in accord with Pfannenstiel, who says that in many of the cases there has been an error in diagnosis, and that a primary sarcoma has been mistaken for a fibroid. In 1000 cases Pfannenstiel[2] has not observed a single case of sarcomatous degeneration of a myoma. The following percentages have been recently given: Watt-Keen,[3] 4 in 417; Kummer,[4] none in 47; Menge,[5] 5 in 76; Hauber,[6] 3 per cent.; Pfannenstiel,[7] none in 1000; Henkel,[8] 1 in 121; Noble,[9] 22 in 1188.

The correlation of fibroid tumors with carcinoma of the fundus uteri has been frequently dwelt upon as another danger to which fibroid patients are subject, and some definite relation between the two has repeatedly been claimed. In other words, it has been said that a myoma

[1] Zeit. f. Geburt. u. Gynäk., 1904, Bd. lii.
[2] Deut. med. Wochenschrift, Bd. xxx. Nr. 14.
[3] Inaug. Dissert., Würzburg, 1902; Referat: Zent. f. Gynäk., 1904, Nr. 5.
[4] Revue méd. de la Suisse Romande, 1904, 4; Referat: Zent. f. Gynäk., Nr. 44.
[5] Archiv f. Gynäk., Bd. lxxii.
[6] Inaug. Dissert., München, 1903; Referat: Zent. f. Gynäk., 1904, Nr. 11.
[7] Deut. med. Wochenschrift, Bd. xxx. Nr. 14.
[8] Zeit. f. Geburt u. Gynäk., 1904, Bd. lii.
[9] American Medicine, vol. viii. No. 11.

growing within the uterine wall exerts an irritative influence upon the endometrium, which results in carcinoma. It is to be emphasized in this connection, Henkel observes, that Klob in the year 1864 found that 40 per cent. of all women dying beyond the age of fifty were the subjects of fibroids. At the present time when autopsies are so thorough the percentage should be higher. As carcinoma of the fundus usually occurs at a late period of life it is not surprising that the two frequently occur coincidently. Carcinoma of the fundus in combination with a fibroid is usually given as being two and a half times more frequent than cervical carcinoma and fibroids, and Noble[1] found this true in the 1188 cases of which he has records. He attributes marked significance to this observation because in women not the subject of fibroids cervical carcinoma is about four times as frequent as corporeal carcinoma. Kruger found in Winter's cases fifteen times a combination with cervical carcinoma, and only eight times with corporeal carcinoma.

INDICATIONS FOR RADICAL TREATMENT OF FIBROMYOMA. The uselessness of any other form of treatment than the operative has recently been dwelt upon by Knapp,[2] while Muret[3] insists that every case must be judged for itself. The social state of the patient and the position of the tumor will often determine the question of operation. Hauber believes that only those myoma which can be kept under constant observation and which either remain the same size or grow smaller are suitable for palliative measures. Pfannenstiel gives the following indications for operation:

1. Tumor larger than a man's head; in younger people, smaller growth, especially if they are multiple.
2. Pain.
3. Hemorrhage.
4. Deep-seated, eccentric myomata, especially subvesical or intraligamentary.
5. Pedunculated, subserous tumors, which show a tendency to torsion of the pedicle.
6. All rapidly growing tumors.
7. All complicated cases, in which the myoma has produced the complication.

Noble, from a study of 1188 carefully observed cases reported by Martin, Cullingworth, Frederick, Scharlieb, McDonald, Hunner, and himself estimates that from degeneration occurring in the tumor itself 16 per cent. of the patients, and from the complications outside the uterus and tumor, 18 per cent. of the patients would have died if

[1] American Medicine, vol. viii. No. 11.
[2] Berliner Klinik., Heft 191.
[3] Revue Méd. de la Suisse Romande, 1904, 6; Referat: Zent. f. Gynäk., 1904, Nr. 44.

not subjected to operation. "Taking them as a whole," he says, "at least a third of the women would have died had they not been operated upon." He holds that the scientific position in reference to the indication for fibroid tumors is that as these facts are incontrovertible—being based on careful clinical and pathological investigations—the indication for operation should be based on these facts, and not on any particular symptom which may be present at the time the woman comes under observation. His position is distinctly in opposition to that which may be called the classic or traditional position, which is that the operation to remove a fibroid tumor should be done because of the symptoms the tumor is producing at the time the patient presents herself for treatment, whether this be hemorrhage, pain, or pressure on the urinary organs or on the alimentary canal, or whether it is a state of mind arising in the patient because of her knowledge of the existence of the tumor. Further on in his article Noble says: "To speak by analogy, a fibroid tumor should be removed for the same reason that an ovarian tumor should be removed; the indications varying in degree, but not in kind. Ovarian tumors are removed irrespective of the symptoms they are producing, because of the knowledge of the life history of these growths, which is, that if left to pursue their usual development, a fatal result will occur in most all cases. Similarly, fibroid tumors should be removed because if left to pursue their usual development in at least a third of the cases a fatal result will occur."

Notwithstanding the excellent paper which Noble has presented in favor of the immediate removal of a fibroid tumor after it is discovered it is my feeling that were this rule to be generally accepted a great many patients would be operated upon unnecessarily and therefore in the end the policy would work harm rather than good. Were this policy solely confined to the best abdominal surgeons, the matter might be somewhat different, for the mortality under these circumstances would be extremely small. In these cases, however, there is an equally great problem to be considered, and that is the effects of the radical operation upon young women in whom fibroid tumors are not infrequently discovered. Many of these cases go on indefinitely without serious symptoms, and to entirely ignore the question of symptoms and institute a universal principle of operation as quickly as a tumor is discovered is hardly advisable.

As has been shown in the preceding pages, the transformation of a fibroid to a malignant tumor is very rarely noted, and also many of the minor degrees of associated inflammatory diseases of the ovaries and tubes at most only give discomfort and at no time seriously threaten the patient's life. Therefore, it would seem that with the knowledge which we already possess concerning the clinical history of these cases and

the fact that they do not, except in rare instances, produce sudden or alarming symptoms, we can still hold to the old or classical indications for operation. In the foregoing pages Pfannenstiel has laid down a rather extensive number of indications for operation, but the chief ones which usually become manifest and may be at once noted by any physician are: 1. Hemorrhage. 2. Malodorous discharge. 3. Pressure symptoms referable to the bladder and rectum. 4. Pain. 5. Rapid growth of the tumor. 6. Continuous dwelling, by the patient, upon the fact that she has a tumor. Concerning the latter indication, a patient is occasionally found who, notwithstanding she is assured that the tumor is producing no trouble, and is not likely to give rise to danger symptoms in the future, becomes morbidly introspective, through dwelling upon the fact that she has a tumor. She continually worries about it, and falls into a neurotic state which may demand the removal of the tumor to relieve this serious mental perturbation.

CARDIAC COMPLICATIONS OF MYOMA UTERI. The cardiac changes in cases of myoma are not well understood, although this complication may suddenly defeat what would otherwise have been a successful operation. A patient subjected to operation for a myoma may perish at its close from progressive weakness of the heart, or the diminished cardiac force may predispose to septic infection, or it may lead to thrombosis of the femoral or pelvic veins and this in turn to pulmonary embolism. Fleck[1] has collected 325 cases of myoma in which an examination of the heart was noted, and he finds that in 133 of these, or 40.9 per cent., there was some pathological cardiac condition. His figures agree remarkably with those of Strassman and Lehmann, who found a percentage of 40.8.

Relative to the etiology of the cardiac complication, the influence of hemorrhage may at once be excluded, for in the 133 cases collected by Fleck, in 34.6 per cent. this symptom had not been present. Brosin in 1894 pointed out that myocardial degeneration in diseases marked by continual loss of blood, other than myoma—*e. g.*, carcinoma, etc.—did not occur. Strassman and Lehmann, after a study of 71 cases from the clinical standpoint, concluded that the cardiac condition, or at least an alteration of the entire vascular system, was the primary occurrence and the direct cause of the myoma. Kessler, on the other hand, after the study of a complete autopsy upon a case of fibroid tumor, believed that the heart affection was due to an increase of aortic tension from circulatory difficulties induced by the tumor.

There are objections to both of these theories. So long as the cardiac change is confined to the myocardium it is unlikely that it is idiopathic and that it antedates the formation of the tumor. On the other hand

[1] Archiv f. Gynäk., 1904, Bd. lxxi. Heft 1.

Kessler's position is not well taken, for if as the result of interference with the circulation an increase of arterial tension were to occur, it would quickly be compensated for by the dilatation of neighboring anastomoses, and therefore would not lead to an increase in the aorta. In contracted kidney, for example, it is not mechanical interference with the circulation in the organ that produces an increase in aortic tension, but a circulating toxin which contracts the smaller arteries and thus increases the tension of the entire arterial system. The author finds from a study of 12 cases at autopsy that the usual cardiac lesion is brown atrophy. In one of Kessler's cases the condition resembled the "myofibrosis cardis" of Dehio. The cardiac complication usually manifests itself clinically as a relative insufficiency. It resembles myocarditis more than any other condition, although it is not identical. The author takes it as an established fact that the degeneration of the heart muscle in myoma is caused by a toxin. That this toxin is a metabolic product from the myoma itself is an impossible conception, for while malignant tumors produce toxins, there is no reason whatever to believe that fibroid tumors are malignant in the ordinary accepted sense. While a few cases of apparent metastases have been reported, all are open to doubt. Furthermore, even in cases of the smallest tumors the heart disease may be very grave and the growth of these tumors is usully so slow that it is hard to conceive of enough metabolic activity in them to produce a toxin. Whence then comes the toxin? Fleck suggests that it may be some poison which affects both the heart and the uterus at the same time, producing in one the myocardial degeneration and in the other a myoma. He next draws attention to the tendency to adiposity of myoma patients (in 325 cases 41 were very fat). This is easily explained by the anæmia and the enforced rest in bed necessary in some of the worst forms of myoma. This observation, however, is offset by the fact that in 41 cases there had been no bleeding in ten instances. He believes, therefore, that there is some direct influence, aside from anæmia, which favors the accumulation of adipose tissue. Attention is called to the frequent accumulation of fat at the menopause and after castration, and experiments and investigations are cited to prove the existence of an internal secretion of the ovary which may hold this tendency in check. Thus Loery and Richter have shown that there is a diminution of the exchange of oxygen after castration.

The author next draws attention to the frequent association of ovarian disease with fibroid tumor of the uterus, and to the influence which castration occasionally has upon the growth of these tumors. He also observes the serious pathological lesions which may be caused in the heart through the perverted activity of a gland with an internal secretion (exophthalmic goitre). Fleck is inclined to believe, therefore, that

the cardiac condition found in myoma is part of a general process which originates in a pathological state of the ovary.

We have reviewed Fleck's paper because it covered the literature and not because we are inclined to agree with him. The trouble with so many writers is that they try to bring the etiological factors of a disease within narrow lines to fit their own especial theory, to the exclusion of all others.

Fibroid tumors of the uterus are, without much doubt, of congenital origin. The accompanying disease of the adnexa is but the result of accident or the mechanical insults to which they are subjected. The heart weakness in myoma, whatever it may be, is certainly the result of several causes—viz., anæmia, accumulation of fat, and disturbance of the circulation. That there are exceptions to all of these is no doubt true, as—*e. g.*, myoma heart without hemorrhage. But a myoma not causing hemorrhage at one time may have caused it at another. That 41 women in 325 should show a tendency to adiposity is not so startling, for this is a very common tendency in middle-aged women.

Choice of Operation. After the decision is reached to operate upon a fibroid tumor which gives symptoms, interest centres in the variety and technique of operation. It is much easier to perform a supravaginal hysterectomy than any other operation for the removal of these growths, and likewise it is less difficult to remove the ovaries with the uterus than to conserve them. The propriety, therefore, of the conservative policy depends upon the necessity for avoiding an early surgical menopause. The advantage of myomectomy over hysterectomy lies in the preservation of fecundity and in the continuance of the menstrual flow. There seems to be added risks, however, in myomectomy, and the operation is usually more difficult than hysterectomy, and both mortality and morbidity are greater following this operation than the more radical hysteromyomectomy. The conservation of the ovaries also, although not difficult, adds to the duration and slightly complicates the technique.

Incidentally we may say that this discussion does not apply to simple submucous or subperitoneal pedunculated tumors which, without question, should be dealt with by myomectomy.

According to Winter[1] only in recent years has myomectomy been applied to interstitial and sessile subperitoneal growths. This has arisen from an increased predilection for conservative surgery, and is the development of a surer asepsis and a better technique. There are many differences of opinion to-day relative to the propriety of myomectomy, and the question is often unfairly treated because different surgeons take

[1] Zeit. f. Geburt. u. Gynäk., 1904, Bd. li.

a position primarily for or against the operation, and refuse to consider the question from any other standpoint. It is only through an unprejudiced examination of the question that it can be decided.

In the absence of the uterus with continued activity of the ovaries, Winter believes there may be disagreeable menstrual molimina with perhaps vicarious bleeding. Glaevecke states that disagreeable sensations not infrequently do occur in the menstrual periods, but these symptoms gradually grow less, and after two years disappear. The psychical effect upon the patient is of more moment and is often intimately connected with the woman's idea of her own well-being and womanliness. The importance of this, of course, depends upon the age of the woman, her maternal desires, sexual proclivities, etc.

Zweifel, Mackenrodt, and others believe that the disappearance of the menstrual flow in itself has a physical influence upon women, and is a factor in painful molimina. Werth has noted a case of painful menstrual molimina with retention of the menstrual flow, and Henkel has observed two similar cases. Moreover, these symptoms have not been known to follow destructive atmocausis of the endometrium, when of course menstruation entirely ceases.

Pfannenstiel says the psychical effects of the surgical menopause may be obviated if the patient is instructed correctly concerning the significance of its cessation. If in exceptional cases the psychic influence is especially to be expected, he concedes that the treatment may be modified accordingly.

Menge[1] thinks it is important to preserve the menstrual flow because upon it so intimately depends the general nervous equilibrium of a woman. It is hard to convince many patients that they are not in a serious physical state without the occurrence of the menstrual function. Many regard it as a cleansing process which must be maintained until the menopause. When artificial cessation occurs they feel that they have lost their *facultas generandi*. This is of no small moment regardless of Pfannenstiel's remarks concerning her education and instructions relative to the harmlessness of this event. Frequently there develops more or less severe functional neuroses, neurasthenia, hypochondriasis, or a mixed neurosis depending upon the individual.

With all these observations for and against conservatism, the question arises, Does it pay to conserve the ovaries after hysterectomy? From a collective study of many operations, Winter concludes that in about 12 per cent. of cases there will be an early climacterium, even though the ovaries have been preserved. This may be blamed to the atrophy of these organs subsequent to hysterectomy, because of interference

[1] Archiv f. Gynäk., Bd. lxxii.

with their blood supply, or to operative manipulation. The author doubts, in view of this fact, whether the conservation of the ovaries after hysterectomy is advisable. Upon this point we must take issue. Some authors agree that it makes little difference to the woman whether her menopause occurs a few years earlier than normal, claiming that her symptoms are no worse than they would be at the proper time. Others have seen distressing results from this premature climacterium. As noted by Winter, in 12 per cent. of these cases the ovaries soon atrophy in the absence of the uterus, and the premature menopause occurs in spite of their conservation. Because in only 12 per cent. of cases Winter has noted the onset of the menopause shortly after the performance of the operation is no argument whatever against the conservation of the ovaries in these cases. In the first place, as he himself admits, this atrophy is doubtless due to a defective technique in the operation. If the ovarian bloodvessels are preserved, as they can be in all cases where the conservative operation is performed, there need be no atrophy following this operation, and, as my own experience shows, the patient will be much more comfortable than if there is a total ablation of the generative organs. As will be seen from the subsequent paragraphs, it is evident that the consensus of opinion is in favor of rather than against the preservation of the ovaries.

Zweifel recommends partial resection of the uterus because of the supposed effect the uterine body exerts upon the nutrition of the ovaries. Werth and Olshausen believe the ovarian activity depends largely upon the preservation of a good blood supply which, if care is not taken, may seriously be interfered with during operation.

Pfannenstiel says that, from a physical standpoint, when the ovaries are preserved there are, as a rule, no untoward symptoms, and if, as sometimes occurs, the ovaries gradually atrophy, even in the worst cases the artificial climacterium is no worse than that the woman would naturally experience sooner or later.

It is plainly evident that the experience of various authors with regard to painful menstrual molimina, and the artificial menopause after the radical and after the conservative operation is nearly diametrically opposed. While these symptoms are not regarded as having the greatest significance, still it cannot be denied that they must to some extent influence the choice of operation. Henkel thinks that in accounting for the conflicting experiences of operators too little attention has been paid to the size of the extirpated tumor. It is frequently found that no painful menstrual molimina follow hysteromyomectomy when the uterus is small, whereas they are most pronounced after the uterus has grown to a considerable size. The exact point beyond which the size of the uterus is capable of influencing the postoperative states can-

not be given absolutely, because in each case there are individual influences which cannot be estimated. In cases of large tumors, Henkel has seen distressing symptoms follow operation, and it seemed to make little difference whether the ovaries were removed or not. Abel and Winter have had similar experiences.

The whole question in view of these apparently contradictory results is a perplexing one. The symptoms, as a rule, differ materially from those of the normal menopause. Henkel carefully questioned 21 patients (selected indiscriminately, exclusive of myoma patients) with regard to the menopausal symptoms, and found that they rarely continued for more than a half to one year, and only rarely caused much suffering. In myoma patients, however, the climacterium occurred on the average five years later; when it did appear there was perhaps more bleeding, but otherwise the symptoms did not materially differ from those in other women. When the myoma had been enucleated at an earlier period the menopause arrived at the usual time, and the case differed in no way from the normal. The author has observed that in those cases of myoma which are so situated in the wall of the uterus (interstitial) that there is a considerable hypertrophy of the muscularis, the ovaries are enlarged and succulent; whereas, in those tumors of the subperitoneal and submucous (pedunculated) variety, the ovaries show no change. He believes that the entire explanation of the difference in the induced menopause in these cases lies in the influence exercised by the uterine body, and in the proper balancing between its internal secretion and that of the ovary. He does not believe in the necessity of menstruation, and has never seen these untoward symptoms follow myomectomy when the uterine body is preserved. To say the least, Henkel has done a deal of theorizing, with a very limited range of observations to sustain his theories.

Pregnancy following Conservative Operations. How often, Winter asks, does pregnancy follow a conservative operation? Including cases which he has followed subsequent to operation, and excluding those over forty years of age, and those because of their social state in whom there was no probability of impregnation, he finds: In 18 cases of myomectomy for submucous myomata 4 conceptions, 22 per cent. In 5 cases of myomectomy for pedunculated subserous myomata, 1 conception, 20 per cent. In 5 cases of myomectomy for subserous interstitial myomata, 1 conception, 20 per cent. In 37 cases of pregnancy following myomectomy, 26 (72.97 per cent.) went on to term. He finds 3 cases (Winter, Amann, and v. Guerard) following operation in women previously sterile. These statistics are, therefore, triumphs for conservatism. Of 46 labors following conservative myoma operations, all were normal except 6, and only 1 of these, a case of Müller,

of adherent placenta, can in any way be ascribed to the previous operation. From his statistics he concludes that (*a*) in women under forty years of age, pregnancy may occur after the removal of subserous and submucous tumors, and of interstitial tumors if they are small; but if larger than a child's head it is very unlikely (*b*) pregnancy after myomectomy usually goes to term in the absence of complications independent of the operation; (*c*) there is no difficulty in labor traceable to the scar in the uterine wall.

Henkel has had 3 cases in his series of 40 myomectomies. It is easy to see how the removal of a myoma might do away with a mechanical obstacle to impregnation. In one of Henkel's cases conception had not occurred, although the woman had been married for a year. The danger of intrapartum rupture of the uterus following myomectomy, so much dwelt upon by a few writers, is practically *nil*, provided the pregnancy begins after the operation. If pregnancy exists at the time of operation, the danger is pronounced and proportionately greater as the time of the operation approaches the time of labor. Henkel believes, however, that in most cases of fibroids the question of pregnancy is not important because these women are usually near the menopause. In a young person, however, it is most important to avoid a mutilating operation for myoma, with a view to the preservation of the childbearing function. In his opinion, Winter's solicitude for the uterus left after myomectomy in its thickened hyperplastic state, when all palpable and visible growths have been removed, is unfounded. The uterus in a surprisingly short time returns to its normal size, and Henkel has never noticed any aggravated symptoms traceable to the uterine mucosa, even when serious hemorrhage from the endometrium had been the chief indication for operation. If in consequence of metritis or endometritis hemorrhage should persist, he does not think it is an argument against the conservative operation, because it can be cured by simple curettage. According to Pfannenstiel the question of subsequent pregnancy also deserves little consideration. Most of the cases occur in virgins beyond the age of thirty, who have no view of marriage, or in women with impotent husbands. Sterility is even an etiological factor in myomata. As a rule, he considers only those cases suitable for myomectomy in which the tumor is submucous and pedunculated or subserous and pedunculated.

Are a patient's symptoms relieved as perfectly by a conservative as by a radical operation? This is considered by Winter from three standpoints:

1. Relative to the recurrence of the myoma.
2. Relative to the relief of symptoms.
3. Relative to the general health of the patient.

In 2000 cases of radical operation reported by Abel, Burkhardt, and Schenk:

(*a*) There was no recurrence of myomata.

(*b*) Ono hundred and eighty-eight patients were entirely relieved of their symptoms.

(*c*) One hundred and ninety-five were in excellent general health and fully satisfied with the result.

In comparing this result with the results of myomectomy, the author excludes submucous myomas removed per vaginam, and includes only cases of interstitial and subperitoneal growths in which laparotomy or colpotomy was performed and opportunity afforded to recognize and remove all the fibroid nodules. In 61 such cases there were 3 recurrences, and in 17 of the author's cases there were 2 recurrences, a percentage of 6.4. If the submucous tumors are included the percentage reaches 8. The recurrence of a myoma after myomectomy, requiring a second operation, therefore, is a strong argument in favor of radicalism.

In cases of myoma uteri, which do not so imperatively require operative interference as carcinoma or an ovarian cyst, the relief of the patient is very essential if she is to undergo the danger and suffering incident to the operation. If relief is not perfect, or entirely fails, the operation falls short of its purpose. As seen above, after 94 per cent. of radical operations, the symptoms were fully relieved. In a carefully selected series of 69 cases of submucous myoma, 27.5 per cent. were not relieved; in 16 cases of subserous pedunculated growths there was a recurrence of symptoms in 37.5 per cent.; of 11 cases of subserous interstitial growths, 45 per cent. continued to suffer. These comparatively poor results may be accounted for by the fact that after myomectomy the uterine musculature frequently is the seat of vascular changes, hyperplasia, and chronic inflammatory changes. Pathological changes in the mucosa incident to the growth of the tumor produce symptoms which lead the patient to seek relief.

With respect to the general health of the patient, and her satisfaction with the results of the operation, Winter finds that 73 per cent. of myomectomies are symptomatically cured, contrasted with 97.3 per cent. following radical extirpations. From these figures the author concludes that in every respect the radical gives far better results than the conservative operation. Henkel reminds us that Winter found from his own cases and those of Engström a recurrence of subserous interstitial growth after myomectomy in 6 to 7 per cent. of cases. Winter says, however, that in but a single case was there a recurrence of symptoms sufficient to require further treatment. Although the age of Winter's cases was not given, Henkel believes that the average time between the first operation and the recurrence, which is given as six years, would

bring these patients to or beyond the menopause, when the myoma would have but little serious significance. The author knows of but 5 recurrences in his own experience after abdominal myomectomy. In 2 of these it was evident at the operation that some of the myomata remained but none of these women had any subsequent suffering and the result of the operation was satisfactory. Because of these recurrences, Winter agrees with Fritsch in looking upon myomectomy as a failure. Henkel quite properly says that there is no more reason for this attitude than there would be in considering operations for prolapsus or the Alexander-Adams operation as failures because there are occasional recurrences, for there is no operation which is invariably perfect in its results. The possibility of a second operation, although seldom required, does not detract from myomectomy, and the danger of a second operation ought not to be overestimated. Furthermore, myomectomy serves a good purpose when it relieves the patient of her suffering, and she may be assured that no new distressing symptoms are to follow as its sequel.

With regard to the relief of symptoms following the various operations and the subsequent capacity for work, Henkel believes the *status presens* of the patient is best determined through personal questioning. He found after the radical operation that heavy work, which had been performed previous to the operation, even though the patient was suffering at the time, was no longer possible after it. After the conservative operation this was not the case; and not only were the symptoms directly attributable to the myoma, as hemorrhage and vesical pain, relieved, but also those of less intimate relationship, such as cardiac distress, shortness of breath, and nervousness. Vaginal discharge has been observed after both operations. The pain which is occasionally noted after myomectomy may be attributed to an exudate which has not been absorbed. This, however, is frequently observed after supravaginal hysterectomy and after other radical operations. In opposition to Winter the author concludes that the results of the conservative operation are better than those of the radical.

Which operation gives the better primary result? It goes without saying, observes Winter, that one should always select the operation least dangerous. Only when the permanent result is of as serious import to the patient as the immediate result is it permissible to select an operation of greater danger, but one affording better chances of ultimate recovery. In his opinion the maintenance of menstruation, the possibilities of subsequent pregnancy, and the avoidance of the artificial climacterium are too trivial to justify myomectomy if this operation is more dangerous. From the statistics of Hofmeier, v. Rosthorn, Wyder, Carle, Wertheim, v. Ott, Martin, Heinricius, Olshausen,

Thorn, Engström, Tuffier, Schauta, Zweifel, Weider, Fritsch, Amann, Chroback, Bumm, Leopold, Pfannenstiel, Döderlein, Burkhardt, and his own, Winter finds: In abdominal myomectomy of subserous interstitial growths a mortality of 9.8 per cent. In abdominal supravaginal hysterectomy a mortality of 4.8 per cent. The conservative removal of submucous and pedunculated subserous myomata is without danger. Menge reports 80 abdominal myoma operations as follows:

1. Supravaginal hysteromyomectomy, after Zweifel	12
Recoveries	11
Death (from cerebral embolism)	1
2. Panhysterectomy	8
Recoveries	8
3. Abdominal panhysterectomy, after Faure-Kelly-Kroenig, splitting of uterus	15
Recoveries	13
Deaths	2
(One death occurred from pulmonary embolism and the other from sepsis following hemorrhage.)	
4. Abdominal panhysterectomy, after Doyen	21
Recoveries	21
5. Abdominal myomectomy	19
Recoveries	19
6. Incomplete operation	3
Recoveries	3

Although the radical operations in Menge's hands have, up to the present time, outnumbered the myomectomies 3 to 1, the mortality of the latter has been *nil*. The author has purposely employed a variety of operations so that he would be able to judge for himself of their relative advantages. With Henkel he asks whether myomectomy is not followed by as good primary results as supravaginal hysterectomy. Henkel bases his query upon the personal examination of 90 myoma patients, in 40 of which abdominal myomectomy and in 50 supravaginal hysterectomy had been performed. He does not believe in vaginal enucleation if the tumor is of any size, on account of the likelihood of mangling the uterus, and the uncertainty of hæmostasis when the uterus is replaced in the pelvis. It has been said, and rightly so, that abdominal myomectomy up to the present time is a more serious operation than the abdominal radical extirpation. Winter notes a mortality after enucleation of 9 per cent., and says that in one-quarter to one-third of all cases there is some disturbance in convalescence. In the hands of unskilled men, the author believes these proportions would be even higher. It is his opinion, however, that with improved technique the convalescence after the abdominal enucleation will be

equally as good as after the radical operation. In the way of improving the technique he strongly insists that there should be no intrauterine manipulation for a number of days preceding operation, so that the uterine cavity may be sterile, and that there may be no abrasions of the mucosa. Even the most skilful hand, he believes, may penetrate the mucosa with a sound and introduce infection into the uterine wall. In cases where intrauterine exploration is required, he recommends a digital examination under narcosis. If it is found at any time that myomectomy is indicated, the surgeon should delay the operation several days in order that the uterus may clear itself of any infectious matter. At the time of operation the patient should be placed in the Trendelenburg position, and after the incision is made the uterus should be delivered through the incision while the intestines are protected with gauze. The hands should not directly touch the uterus or the tumor during the enucleation, the various manipulations being made with instruments. The uterine muscle is incised over the tumor, and the entire myoma is dissected out of the musculature without cutting through its capsule at any part. The wound is closed from the bottom with fine catgut, which is not touched by the hands. The serous borders of the incision should be inverted slightly by the outer suture. To prevent serious hemorrhage, the uterine arteries may be compressed by forceps, or by an assistant who grasps the arteries between pieces of gauze. Care should be taken to make as neat an incision as possible, and, in case of multiple myomata, as few incisions as possible. The author has not found it a serious complication if the uterine cavity is opened, provided care has been taken to render it aseptic. His reasons for not shelling the myoma out of its capsule are these: the capsule is usually rather thick and poorly vascularized, and it is more difficult to obliterate by sutures such a cavity than one left in the softer, more vascular uterine tissue. If the bed of the tumor is not completely obliterated blood may collect therein, and in the presence of infection forms an excellent culture medium. In the event of hemorrhage after enucleation the blood is much less quickly absorbed when it is confined to the thickened, poorly vascularized capsule. The author has frequently found in the microscopic examination of the capsule of myomata small fibroids, which increase the dangers of recurrence if this structure is left behind.

Menge believes that enucleation has a technical advantage in many cases. The danger of injuring the bladder, ureter, or bowel is eliminated, which cannot be said of the radical operation. He cites the following objections to myomectomy which have been made by its opponents: 1. The further growth and development of undiscovered nodules. 2. The possibility of excessive hemorrhage during the operation. 3. The

possibility of hemorrhage into the bed of the tumor following operation and the subsequent infection of the blood coagulum. 4. Air embolism from the bed of the tumor. 5. Weakness of the uterine wall after myomectomy predisposing to rupture of the uterus in a subsequent labor.

Relative to the last objection, it may be said that many of those who dwell upon the possibility of uterine rupture following myomectomy negative their argument by asserting that pregnancy is as good as out of the question after myomectomy. In order to eliminate as far as possible the other objections and dangers of this operation, Menge offers certain improvements in technique. In the first place he renders the field almost bloodless by ligating the vessels which supply the particular area in which the tumor is found. In the second place he takes great care in obliterating the bed of the myoma and closing the peritoneal surface at the uterine incision. Thus, for growths occupying the uterine wall at the fundus, he places ligatures around the branches of the uterine artery supplying the uterine wall. These are introduced medially from the point of origin of the vessels and never include the cervical branch, nor is the anastomosis with the tubal branch of the ovarian artery disturbed. This method of ligation will materially lessen the amount of blood sent to the uterus, while it will have no effect upon the tubes and ovaries. There is also no tendency to necrosis and no disturbance in the healing of the uterine incision. Menge has never seen any bad result from this procedure. He has never observed a case of pregnancy following operation and is, therefore, unable to say what would occur in this event. If the tumor is intraligamentary all the vessels of that side of the uterus must be tied, which includes all of the uterine branches and those supplying the broad ligament in the passage of the uterine artery through that structure, the artery of the round ligament, and the ovarian artery. In case the location of the tumor makes the application of these sutures difficult or impossible, it is better to enucleate first and tie afterward, or to abandon the conservative operation and perform a hysteromyomectomy. At any rate, one should always observe the condition of the ovary on the opposite side before tying off one broad ligament. In case the adnexa are diseased they must be removed, although Menge is a firm believer in the conservation of as much ovarian tissue as possible.

By thus shutting off to a great extent the afferent and efferent blood supply to the bed of the myoma, Menge avoids hemorrhage during operation, makes it impossible for air embolism to occur, and is able quickly and carefully to catch all spurting vessels in the bed of the tumor, and obliterate the latter by careful suturing with fine catgut. The peritoneal borders of the incision are inverted and united by a buried catgut suture, thus leaving no line of raw tissue to which the bowel might become adherent. The author strongly favors abdominal myomec-

tomy instead of vaginal myomectomy. When myomectomy is impossible, then Zweifel's supravaginal amputation is performed. Menge prefers the Doyen panhysterectomy for the abdominal operation, and one or both ovaries are always conserved whenever possible.

There should be no rule of thumb in the choice of either the radical or the conservative operation. Both Menge and Henkel are strong advocates of the less radical myomectomy, and Menge's suggestions are invaluable in the improvement of the technique of myomectomy. On the other hand, Winter's conclusions which follow are most logical. They are:

1. Myomectomy preserves menstruation.

2. Myomectomy makes possible subsequent pregnancy in women under forty years of age. This most often occurs after the removal of submucous and subserous growths. It is very unlikely to occur after the enucleation of subserous interstitial growths larger than a child's head. The pregnancy goes on to term and the labor is easy if the genitalia are otherwise sound.

3. Myomectomy guards against artificial menopausal symptoms which occur in 12 per cent. of radical operations (conservative-radical, one or both ovaries left after hysterectomy).

4. Myomectomy, even if every visible and palpable tumor is removed, does not guard absolutely from recurrence. When a secondary radical operation is required the conservative operation must be looked upon as a failure.

5. Myomectomy does not surely relieve the suffering of the patient.

6. Myomectomy by the vaginal as well as by the abdominal route gives worse immediate results than the radical operation.

As the result of this investigation Winter lays down the following rules:

1. Pedunculated subserous tumors, when the uterus is free from other nodules, submucous polypoid growths, and huge myomata which cause an enlargement of the uterus up to the umbilicus or above that point (and which may be removed in several sittings from below), unless the uterus is fixed, should be subjected to myomectomy.

2. Sarcoma or myoma complicated by carcinoma must be treated radically.

3. In the following cases a choice must be made to suit the individual condition:

(*a*) The sessile subperitoneal growths.

(*b*) The purely interstitial growths.

(*c*) The sessile submucous growths when the cervix is entirely closed.

(*d*) Multiple myomata of different forms.

Myomectomy has but an individual and conditional advantage.

The patient, not the physician, can estimate its value. In particular cases it may profoundly influence the subsequent life of the patient, while in others all that is gained by the myomectomy is of absolutely no value to the patient. Therefore, in deciding between a radical and a conservative removal the patient should have the situation explained to her and should decide the question, judging it according to the value she places upon the continuance of menstruation and the possibility of conception.

With regard to the choice of operation for fibroids in pregnancy, the author from his own and the statistics of others favors myomectomy. He finds that this operation is not more dangerous during pregnancy, and it has the further advantage of preserving the child's life in 75 to 80 per cent. of cases.

Pfannenstiel does not approve of the enucleation of large interstitial growths, multiple tumors, or adenomyomata, believing that they should be treated radically without regard to the function of the uterus. In these cases he employs either abdominal supravaginal hysterectomy or complete vaginal hysterectomy. He advocates the conservation of the ovaries, or at least one ovary in every case before the menopause. In his opinion the occasional suffering which may arise from the conserved ovary is as nothing compared to the symptoms of the artificial climacterium observed after castration. As to the choice of operation, the abdominal is preferable in case the tumor is large or there are adnexal complications. There is no doubt that a patient suffers less after a vaginal than after an abdominal hysterectomy, but in extenuation of the abdominal hysterectomy it may be said that there is no doubt that this operation is selected in the severest cases, and therefore the post-operative results are not comparable upon an equitable basis.

Pfannenstiel has had 6.5 per cent. mortality in 108 abdominal operations as compared to a mortality of 4.05 per cent. in 43 vaginal total extirpations.

Prolapsus Uteri. Bürger[1] finds a cause of prolapsus in defective innervation of the muscles of the pelvic floor and thus accounts for some of the cases seen in young primipara. He notes a number of instances of congenital prolapsus associated with spina bifida, in which malformation of the sacral plexus had prevented the proper development and functional activity of the pelvic floor.

G. Winter[2] states that 2.5 per cent. of 243 prolapsus cases collected by Götz occurred in women who had not borne children. The processes of pregnancy, labor, and the puerperium are, of course, the chief causes

[1] Archiv f. Gynäk., Bd. lxxii. Heft 2.

[2] Sammlung. zwangl. Abh. a. d. Geb. der Frauenheilk. u. Geburtsch., Bd. v Heft 8.

of prolapsus, and if every puerperal woman was carefully examined at the end of the childbearing cycle the predisposing factors to a prolapsus would usually be discovered.

Senile involution is also a frequent cause. This affects principally the muscular and fatty tissues, and as it is unavoidable, prophylaxis plays no part in its prevention. This author lays little stress upon trauma or straining as causes of prolapsus. While it is true that an accidental trauma may directly precipitate this disability, as a rule it only makes evident a previously latent prolapsus, or precipitates symptoms. Thus, severe exertion, heavy lifting, and frequent coughing in the presence of relaxed tissues from senility or childbirth may directly lead to a prolapsus. Unless the traumatism is severe enough to produce an actual rupture of the uterine supports it is not sufficient to produce a serious downward descensus. This may be demonstrated upon the cadaver, for a prolapsus may only artificially be produced by cutting some of the uterine ligaments.

With regard to the etiological influence of childbirth, the author notes that while a perineal tear may be united by an immediate perineorrhaphy, it is difficult to restore the vagina by an operation if it is pushed down and separated from its pelvic attachments. If this detachment is subcutaneous it may not be detected until after the patient has been on her feet for some time. The early use of the forceps and excessive bearing down by the patient are predisposing influences in the dislocation or detachment of the vaginal tissues. The author, therefore, offers the following prophylactic cautions:

1. Never encourage a patient in labor to bear down until nature excites this inclination.

2. The use by the patient of tractors to increase the voluntary expulsive effort is questionable.

3. Never apply forceps without a complete dilatation of the cervix. When a more precipitate delivery is necessary it is best to incise the cervix.

4. Never use forceps without a positive indication. Secure the gradual passage of the head through the vagina and over the perineum.

5. Carefully suture every perineal laceration immediately after labor.

During the puerperium:

1. Avoid overdistention of the bowel and the bladder.

2. Keep the patient in bed twelve to fourteen days and caution her against hard work for six weeks.

Examine the patient six weeks post-partum for any descensus. The author offers several objections to the use of the *pessary:*

1. It keeps the vaginal walls on tension and causes overstretching; and although it may correct the displacement for the time being, the relaxation becomes progressively worse.

2. It acts as a foreign body in the vagina and may produce ulcers, discharge, and inflammatory affections about the uterus and the vagina. Even though douches are systematically employed and the pessary is occasionally removed, a patient can scarcely undergo the pessary treatment for a year without having some untoward local effect.

3. It requires time, trouble, and money for the patient's cure. At the present time a pessary is used by Winter only when an operation is contraindicated.

His contraindications to operation are:

1. Extensive prolapsus in badly nourished patients or in those with chronic visceral disease.

2. Very early cases of retroversio flexion with vaginal descensus. Here suitable measures may cure the disability without operation.

Retroversio Uteri. The various malpositions of the uterus are a perennial source of discussion, and while perhaps the gynecological world is approaching somewhat nearer the solution of the treatment of these cases, nevertheless there are as yet very divergent opinions concerning several questions at issue. The symptoms directly emanating from a retroflexion as well as the operative treatment will again be taken up in the following pages.

Symptoms and Indications for Treatment. Graefe[1] represents a class which opposes, or rather limits, the surgical treatment of these cases. He claims that the simple retroposition of a normal uterus requires no treatment, and the symptoms from which these patients usually complain are not referable to the malposition. In such cases a careful history and a general examination will usually reveal chlorosis and hysteroneurasthenia. The latter conditions should be treated and the patient should be kept in ignorance of her condition. Only when the patient knows she has a displacement and has a fixed idea that she will never be well until it is corrected should an operation be undertaken. In such a case the Alexander operation is advisable.

The operable cases are those in which there is persistent sterility or in which the uterus and its appendages are adherent, and in some instances when the retroposed uterus is enlarged, hyperæmic, sensitive, and there is associated prolapsus of the ovaries.

Relative to the treatment of a retroposed, pregnant uterus, he believes it is not always necessary to even replace it, but if the patient cannot be kept under constant observation, and especially if the fundus is situated deep in the pelvis or if there are symptoms of incarceration, or in cases in which there have been repeated miscarriages, the uterus should be replaced and held temporarily by a pessary. If the retroposed, pregnant

[1] Sammlung. zwangl. Abh., Bd. v. Heft 2

uterus is adherent and attempts at replacement are ineffectual, this serious disability should be corrected by operation.

Skutsch[1] is likewise in accord with the opinion that a retroposition may have no clinical significance, as, for instance, virginal retroposition and retroposition of a senile uterus. He emphasizes the necessity for careful study of these cases, and especially speaks of the difficulty of determining in neurotic women whether the retroflexion is an accidental coincidence or whether there is a definite relation of cause and effect.

Nacke[2] has examined 265 cases with reference to pain, and found but 37 (14 per cent.) in which it was absent. However, after analyzing these cases and excluding all possible sources of error, at the same time bearing in mind the personal equation of the various patients and of the physicians who made the diagnoses, the author believes that this malposition produces pain only when the uterus is enlarged. If, on the other hand, the uterus is normal in size and its ligaments are of natural elasticity and the adnexa are healthy, no pain is experienced. There are cases, however, in which all of these conditions obtain, and yet there is severe suffering. So far as gross structural changes are concerned, this symptom is inexplicable. It is possible that there may be minute pathological alterations in the tissues or in the nerve supply of the generative organs.

Many operations have been devised for the permanent replacement of the uterus, and as several have given good results it is probable that they may be of equal worth. There is no doubt that none is applicable to every case of retroposition or prolapsus, and each operation should be studied with a view to its adaptation to the proper cases. G. Winter[3] prefers *ventrosuspension* to Alexander's operation for young women during the childbearing period, for while the latter is not dangerous, is easy of execution, and causes no dystocia in subsequent labor, there is no assurance against recurrence. For women beyond the childbearing period he prefers *vaginal fixation*. In all cases of retroflexion, except in old women with atrophic uteri, he considers it advisable to suspend or fix the uterus when perineorrhaphy is necessary. In Winter's cases of vaginal fixation he has had 76.3 per cent. of 38 cases permanently cured.

So far as American gynecologists are concerned, vaginal fixation has never been a popular operation, and it has long since largely been abandoned; therefore, we cannot approve of Winter's advice in these cases.

Reifferscheid[4] has studied the results in 241 cases of the *Alexander*

[1] Archiv f. Gynäk., Bd. lxxii. [2] Zent. f. Gynäk., 1904, Nr. 47.

[3] Sammlung. zwangl. Abh. a d. Geb. der Frauenheilk. u. Geburtsch., Bd. v. Heft 8.

[4] Archiv f. Gynäk., Bd. lxxii Heft 1.

operation, performed in the Bonn Gynecological Clinic, and has also carried out investigations upon 12 cadavers, to determine its value. As the result of his studies, he regards ventrosuspension as the most effective operation for the cure of a retroposition. The Alexander operation is the safer, and if the uterus is mobile it gives almost as good permanent results as ventrosuspension. He discards vaginal fixation.

On account of the difficulty of finding the round ligament outside of the external abdominal ring, Beuttner believes that it should be sought for at the inner ring or in the inguinal canal. Other operators do not agree with him, but admit that in exceptional cases the ligament may be so attenuated that it cannot readily be found, under which condition the pillars of the external ring must be divided and the ligaments picked up in the canal. While trouble has also been experienced by some operators in finding the external ring it is usually attributable to inexperience rather than to any inherent fault of the operation. Occasionally after the isolation of the ligaments they may rupture in the attempt to shorten them, but with proper care this accident should only exceptionally occur. In shortening the ligament the peritoneum is stripped back, but not opened; if, however, the ligament should break it will be necessary to open the peritoneal cavity and secure it farther back. After the Alexander operation the bladder does not have the same freedom in its upward distention, and therefore distends laterally. On account of the pressure on the uterus during vesical distention it is necessary to avoid this condition for some time after the Alexander operation. Before operation the patient is catheterized and a pessary is introduced which remains in place until she is about to be discharged from the hospital.

Nothing new is offered in his article concerning the technique of the operation. He takes especial care to separate the accompanying nerves, and believes it is just as well to complete the operation on one side as to expose both ligaments at the same time. His results are given in tabular form:

Number of cases	241
Deaths (from pulmonary embolism after infected posterior colporrhaphy operation)	1
Healing of incision by granulation	18
(Seventeen occurred in the first 107 cases, when the technique was not perfected. In the last 134 cases this complication occurred in but 1 case.)	
Difficulty in finding the ligaments, one or both	18
Rupture of ligament, one or both	14
Good position of uterus at time of discharge from hospital	235
Position of uterus same as before operation	6
Percentage of recurrences in 90 cases examined by the author two months to five years (most of them six months to two years) after operation	5.5 per cent.

In 39 patients pregnancy occurred after the operation. Four abortions occurred; 22 had been delivered, and 13 were pregnant at the time of the author's paper. The labors were uneventful in all but 4 cases; 2 requiring postural treatment and 2 instrumental delivery.

The author also reports 61 Alexander operations in conjunction with operations with prolapsus uteri. In only 2 of the latter which were afterward examined was there any recurrence. As a result of his experience he believes this operation to be the least dangerous and the easiest for uncomplicated cases. In cases of simple retroposition, especially in the better classes of patients, he employs the pessary; but among the working classes, where time and money must needs be husbanded and where immediate results are requisite, he at once resorts to operation.

Steidle[1] reports 60 Alexander operations from the University clinic in Strassburg, of which 49 were afterward examined at periods of from two months to two and a half years, with 4.4 per cent. of recurrences. The indications for operation closely coincide with those of Riefferschneid.

Spaeth[2] objects to ventrofixation because it draws the uterus into the abdomen, while normally it is a pelvic organ. Furthermore, Kreutzmann, Gradenwitz, Michel, and others have shown the dangers following this operation from obstruction of the bowel. Spaeth prefers the Alexander operation in cases of mobile retroflexion; while in adherent cases or those complicated by adnexal disease he performs a vaginal section and fixes the uterus by vaginal or vesical attachment. There are many cases, however, in which dense adhesions associated with tumors, wide adhesions to the bowel, and absolute effacement of Douglas' pouch make an abdominal operation imperative. Under these circumstances he makes Pfannenstiel's suprapubic transverse incision, and after treating the adnexal disease and the adhesions of the uterus he grasps the round ligaments close to the internal ring, thrusts them through the ring, and then through the fascia of the abdominal wall at the extremities of the transverse incision. The peritoneum is stripped off from the ligament and the uterus is drawn forward in full sight to a proper anteposition, when the ligaments may be sutured in their new position with buried silkworm-gut or silk. The internal ring should be closed by suturing.

Sonnenfeld[3] is a firm believer in vaginal fixation or suspension of the uterus. He has reviewed 274 cases of retroposition operated upon at Orthmann's clinic in Berlin, upon whom several different operations were performed. They were as follows:

Vaginal fixation	210
Alexander's operation	26
Ventral fixation	38

[1] Monat. f. Geburt. u. Gynäk., Bd. xix. Heft 2
[2] Zent. f. Gynäk., 1904, Nr. 17. [3] Monat. f. Geburt. u. Gynäk., Bd. xix. Heft 4

The vaginal fixation comprised 165 intraperitoneal vaginal suspensions, 16 extraperitoneal suspensions, and 29 fixations of the round ligaments. The comparative results are best shown in the following table:

PREGNANCY FOLLOWING OPERATION.

Variety of operation and number of cases.	Tubal pregnancy.	Abortion.	Pregnant at time of report.	Labors.		Died.	Recurrence.	Permanent cure.	Unknown.
				Spontaneous.	Instrumental.				
Vaginal fixation:									
1. Intraperitoneal . . . . 165 cases.	1	2	...	3	...	1	2	84	78
2. Extraperitoneal . . . . 16 cases.	...	...	...	3	...	...	...	11	5
3. Round ligament . . . . 29 cases.	...	...	1	...	...	...	...	18	11
Alexander's operation . . . 26 cases.	...	1	1	2	1	...	3	11	12
Ventral fixation . . . . . 38 cases.	...	...	...	1	1	4	1	20	13
Total . . . 274 cases	1	3	2	9	2	5	6	144	119

The technique of intraperitoneal vaginofixation as employed by Sonnenfeld[1] is as follows:

A longitudinal incision is made in the median line of the anterior vaginal wall. The vaginal wall is stripped up on each side of this incision. About 1 cm. below the vesical border a transverse incision is made down to the cervix; the bladder is then pushed off from the cervix by blunt dissection, and, after finding the uterovesical fold of peritoneum, it is fixed with artery forceps and divided in a longitudinal direction, the anterior extremity of the peritoneal incision being fastened to the anterior extremity of the vaginal incision by a provisional suture. The anterior face of the uterus is caught as high up as possible and brought through the incision. Three sutures are passed into the uterine wall, the lowermost on a level with the uterovesical plicæ, and each of the two remaining about 0.5 cm. above the last, so that the highest is at a point somewhat under the middle of the fundus or 1.5 to 2 cm. above the level of the uterovesical fold. The ends of these sutures are carried through the border of the peritoneal and vaginal incision on their respective sides and tied. The remainder of the incision is closed from below upward with a running suture. The patient is allowed to leave the clinic on the seventeenth day. In this operation it is of course possible

[1] Monat. f. Geburt. u. Gynäk., Bd. xix, Heft 4

to break up posterior adhesions before placing the sutures. The author does not like Alexander's operation because it is only applicable to mobile cases, and because when colporrhaphy operations are required additional incisions must be made outside of the vagina, whereas if vaginal fixation is used this is not required. The difficulty in finding the ligament, its liability to rupture, and the author's high percentages of recurrence after the Alexander operation have led him to abandon it. He reserves ventral fixation for bad cases of adherent retroposition, and those in which adnexal disease is present.

Garrigues[1] in a recent article upon vaginal fixation says:

1. Vaginal fixation is a comparatively safe operation; in 120 cases there was no fatality and no injury occurred to the bladder.

2. The results of the operation are lasting; thus, of 78 extraperitoneal cases, 16 were afterward examined at a more or less remote period, varying from three months to two and a half years, and three times the uterus was found in the pelvic axis and twice in retroposition; in all of the others the uterus was in good position. Of 42 intraperitoneal cases, 9 were examined from three months to two years afterward, and there was but one recurrence.

3. There is no external scar from this operation.

4. The ovaries and tubes are accessible to operation if found diseased.

5. Plastic operation required at the same time may readily be performed.

6. Subsequent gestation is not complicated if the method is well chosen. Of 120 cases 12 became pregnant; of these 2 aborted. One, however, later bore a child normally. The rest had uneventful labors.

Garrigues makes a long incision from a point 1.5 cm. back of the meatus to a point below the posterior border of the bladder, as determined by a metal catheter. Silkworm-gut sutures are employed, and the first is introduced near the anterior end of the vaginal incision, passing through the peritoneum into the fundus of the uterus and back, the bladder in the mean while being retracted. A second suture is similarly passed. The peritoneum is closed with running catgut and the vaginal incision with silkworm-gut sutures. The sutures are left in place for seven weeks, the patient going home in the mean time. Silk is never to be used, as it carries infection.

Guérard[2] believes that the disturbances in labor following ventral or vaginal fixation are due to faulty technique in performing the operation. He has adopted the American methods of ventral suspension. The object of the operation, he says, is the same as that of a well-fitted pessary—viz., that it shall suspend the uterus only until

[1] International Journal of Surgery, New York, November, 1904.

[2] Monat. f. Geburt. u. Gynäk., Bd. xix

raw surfaces made by the release of adhesions at the time of operation are healed, and until the true ligaments of the uterus have regained their tone. The author reports 57 cases of labor following ventrosuspension and 41 cases following vaginosuspension. In 4 cases after ventral suspension labor occurred twice. In 49 of these cases the suspension was performed in association with other pelvic operations. In this series there were 51 easy labors; in 2 the retroposition of the uterus recurred; in 5 forceps were required. Of the 41 births following vaginal fixation, which occurred in 39 cases, all were uneventful but 4, in which the application of forceps at the pelvic outlet was necessary. As to the frequency of abortion following these operations, he has noted 7 instances after ventral and 4 after vaginal suspensions.

Kiriac[1] emphasizes the fact that the suspension operations for prolapsus may all fail. He recommends suturing the fundus to the parietal peritoneum after freshening the opposing surfaces until they bleed. After fixing the uterus the bladder is also sutured to the fundus. He styles this operation "hysterocystoventropexie."

Bardescu,[2] in the typical German fashion of ignoring American work, reports a new operation for retrodisplacement through the fixation of the round ligament in the fascia of the abdominal wall. It resembles the operation of Noble, of Atlanta, reported in last year's PROGRESSIVE MEDICINE, and is more or less like the operation described by Gilliam, Montgomery, and others.

Kocher[3] advises an operative procedure for inveterate cases of uterine prolapse as utterly devoid of surgical sense as is possible to conceive. He styles this operation "exohysteropexy." The technique of exohysteropexy is as follows: a median abdominal incision is made, through which the uterus is pushed until it is almost outside the abdominal cavity. It is fixed in this extraperitoneal position by closing the peritoneal incision above and below it and attaching the peritoneum to the sides of the uterus. The ovaries are left inside the peritoneal cavity. The fascia is either sewn over the uterus, or it may be attached to the uterus so it will lie directly under the skin. Care should be exercised not to fasten the uterus too near the symphysis pubis, as it may interfere with the function of the bladder. After this operation menstruation is normal. If pregnancy should occur, Kocher advises the release of the uterus so that it will slip back into its former position. Of the operations yet invented this appears to be the most unsurgical of them all, and we can see no justification whatever for its employment. It is only mentioned to be unreservedly condemned.

[1] Referate: Zent. f. Gynäk., 1904, Nr. 4
[2] Zent. f. Gynäk., 1904, Nr. 3.
[3] Deutsch. med. Wochenschrift, Bd xxx. No. 15.

Wiggin[1] puckers up the broad ligament on each side of the uterus by a suture, which starts at the cornu of the uterus and is carried in purse-string fashion to the pelvic wall and back. These sutures on being tied shorten the broad ligaments on either side and afford a new point of attachment for the uterus at the pelvic brim.

Menge[2] reports a method of suspension of the uterus which he has used for three years. The operation consists in shortening the round ligaments on each side and then attaching them to the anterior surface of the uterus. The technique of the operation may be described as follows: A point is selected on each round ligament about a third of the distance from the cornus uteri to the internal abdominal ring. This is secured with catch forceps and drawn toward the median line, making a V of the uterine two-thirds of the ligament. The limbs of the V are now approximated with running catgut. The reduplicated ligament on each side is then drawn over the anterior surface of the uterus just below the fundus until the point of the obliterated V in the ligament meets its fellow on the opposite side in the middle line of the uterus. A running catgut suture unites the reduplicated ligaments to the uterine fundus in this position. The fold of broad ligament thrown up on either side by displacing the round ligaments inward in this fashion is now united along its edge on either side to the uterus. Menge claims priority in this operation and makes a point of using nothing but catgut for his sutures. He is attacked by Kleinwachter,[3] who says that what is practically the same operation was described by Palmer Dudley[4] ten years ago. Dudley freshened the anterior surface of the uterus in the median line below the fundus and also the anterior surface of the broad ligament in the form of a small ovoid. These raw surfaces on either side were then approximated to the anterior surface of the uterus by means of catgut sutures. This Kleinwachter affirms is essentially the same as Menge's operation and catgut sutures are entirely employed.

Menge's operation or the operation described by Menge closely resembles a procedure which I have been using for the past two or three years. As carried out in my clinic the operation differs in several points from those described. In the first place the round ligaments are buried in shallow incisions made in the fundus of the uterus anteriorly, and at least one or two silk sutures on either side are used. I believe to be sure of permanent results from this operation the incisions into the fundus are necessary for a firm attachment of the ligament.

Limitations of Vaginal Section. As a result of the continuous discussion of the advantages and disadvantages of the abdominal and vaginal

[1] Journal of the American Medical Association, vol. xliii. No. 23.
[2] Zent. f. Gynäk., 1904, Nr. 29.
[3] Ibid.
[4] American Journal of Obstetrics, 1895, p. 732.

methods of operating for pelvic diseases, a point has been reached when perhaps we can more accurately define the limitations of each method. Coincident with the development of abdominal surgery during the last three years, unquestionably the preponderance of evidence has been in favor of the abdominal section.

Recently Webster has defined the limitations of vaginal section in a very clear and concise way, and I believe he has very fully expressed the best surgical opinion upon this subject. Outside of the very important question that through an abdominal incision one is able to very fully inspect and remove diseased structures directly under the eye, there is a very great advantage in being able to take into account other abdominal organs which may also be the seat of disease, or indeed may have given rise to the dominating symptoms.

In speaking of vaginal section Webster[1] says that "the idea which some operators set before them—of merely removing some pathological condition—is a very bad one, and is out of harmony with the trend of the best work of recent years." It is equally important to operate in such a manner that the after condition of the patient may be the best. To this end raw surfaces must be covered as far as possible, and various other niceties be carried out for the benefit of the organs or parts left behind. To do this the abdominal route must be chosen. Plastic operations on the appendages or suspension of them is difficult or impossible by the vaginal route. The vermiform appendix is involved in a considerable number of cases of pelvic inflammatory disease, and the man who adopts the vaginal route extensively in these cases will be certain to leave behind a certain number of diseased appendices; the accident, too, will happen occasionally of tearing the appendix or the bowel in the separation of adhesions. The opportunity to explore the abdominal cavity and determine the condition of the gall-bladder, kidneys, and other organs is one of the great advantages of abdominal section.

Statements concerning the diminished mortality in colpotomy are misleading, for it is impossible to establish a fair comparison between the two operations. Complicated cases are, beyond doubt, best handled by the abdominal method. Cases performed with equal ease for either route should have in the hands of an expert the same mortality. In virginal or nulliparous women the vaginal route deserves no place. The author gives the following conditions under which the vaginal route may be properly considered:

1. Myoma uteri; small myomata. Extirpation of the entire uterus by morcellement, when the diameter of the fibroid uterus is not more than five inches, there are no adhesions, and the vagina is roomy.

[1] Wisconsin Medical Journal, May, 1904.

2. Malignant disease of the uterus. The author thinks it is still a question whether the abdominal operation justifies the claims of its advocates.

3. Retroposition of the uterus. This may be relieved by shortening the round ligaments or by vaginal fixation. However, in the majority of cases this condition when it requires opening of the peritoneum may best be handled through an abdominal incision.

4. Inversion of the uterus.

5. Intrapelvic adhesions. As said before, the abdominal route is distinctly preferable because raw areas may be covered.

6. Diseased ovaries. Small, movable, thin-walled, and non-adherent cysts may be removed in this way. Resection is possible. Large, malignant, multilocular, adherent, and intraligamentary cysts, and those with torsion of the pedicle are not suitable for the vaginal operation.

7. Tubal diseases. In any case with adhesions or in complicated cases the vaginal route is risky.

8. Pelvic abscess. Incision and drainage is often indicated whatever the source of the abscess, provided it is easily palpable through the posterior fornix.

9. Ectopic gestation. In the early weeks the pregnant tubes may be removed by a vaginal section. There is less risk of rupturing the tube by the abdominal route and less risk of hemorrhage. After the tube ruptures, in the presence of a pelvic hæmatocele, vaginal incision and gauze drainage may be very satisfactory. Occasionally the bleeding recurs, when it may be necessary to open the abdomen.

10. Extensive infection of the genitalia. In bad cases, where total extirpation is required, the abdominal operation is to be preferred for the treatment of adhesions and denuded areas.

11. In serious cases complicated by a visceral lesion—*e. g.*, of the heart, lungs, or kidneys—the vaginal route is supposed by some to diminish the risk of shock. By carefully preparing the patient, swiftness in operation, and more local anæsthesia, the surgeon will have as good results by the abdominal as by the vaginal route.

12. Exploration. Vaginal incision for digital exploration of the pelvis is very limited in its scope. There is always a possibility in vaginal section that abdominal section will be necessary to complete the operation.

There are several forms of incision for vaginal section. Anterior colpotomy is the one usually employed. Webster's anterior colpotomy incision is thus described by him: It consists first of "a circular incision around the cervix just below the attachment of the vaginal wall. This is joined by a mesial incision an inch and a half or more in length, dividing the anterior vaginal wall. The cervix being well pulled down,

the wall of the vaginal vault is stripped upward until the anterior pouch is reached. The anterior vaginal wall is also stripped somewhat from the base of the bladder. The uterovesical pouch is then opened."

The author believes his method allows more downward dislocation of the uterus than the other forms and gives better access to the parts. Additional space may sometimes be gained by a transverse incision into the pouch of Douglas. It may be advisable occasionally to tie the uterine artery on one or both sides. Where there is difficulty in bringing down the uterus the base of the broad ligaments close to the cervix may be divided. At the completion of the operation the uterus is pushed back into the pelvis and the peritoneal and vaginal wall incisions are closed with catgut.

Posterior colpotomy is used only for breaking up adhesions posterior to the uterus and opening collections of fluids in Douglas' pouch.

If amputation of the cervix is to be performed it is left until the close of the colpotomy operation, after the peritoneum is closed. The margins of the vaginal flaps are sewed to the cervical canal after amputation of the lips. If the size of the uterus is a hindrance in colpotomy, the cervix may be amputated early, immediately after stripping off the vaginal wall.

When anterior colporrhaphy is required the redundant tissue is removed at the beginning of the operation in connection with the first incision.

Diagnostic Use of the Uterine Sound. Methods of diagnosis, which in the preantiseptic era were followed by the direst results, may now be used with comparative safety, provided all of the precautions which attend a carefully conducted operation are observed. The uterine sound which was so universally employed in making a diagnosis before these dangers were realized, unquestionably left in its train an untold number of pelvic inflammatory cases which otherwise would not have occurred had not the septic instrument been passed into the cavity of the uterus. As a result of this sequel there was a universal protest made against the employment of this instrument, except in the rarest instances; and while these objections may be, to some extent, modified under proper precautions at the present time, nevertheless it would be a very hazardous policy for any teacher to countenance the use of the uterine sound for routine use in making a diagnosis. The certainty with which one may make a diagnosis through a bimanual pelvic examination renders obsolete an instrument which was employed before the development of this diagnostic means. Certainly a uterine sound should never be passed in the old-fashioned way, by guiding it to the external os by the index finger, for the dangers of infectious matter being carried directly into the uterine cavity are very manifest.

The proper method of introducing a uterine sound is first to expose the cervix to view with a bivalve speculum. The external os should then be thoroughly disinfected with pledgets of cotton soaked in 1:1000 or 1:500 bichloride of mercury solution, after which the sound may be introduced without coming in contact with the speculum, and enters directly into the uterine cavity without touching the surrounding parts.

In the following article various indications are given for the use of this instrument. It is with reluctance that we review this article, for in the hands of inexperienced or careless persons the uterine sound should never be used, and unfortunately it is this very class of irresponsible people who employ it.

Brothers[1] gives the following as conditions under which it is justifiable to use the uterine sound. To determine:

1. The patency of the internal or external os. Constriction of the internal os, in his experience, is one of the most frequent causes of sterility and dysmenorrhœa, and can only positively be diagnosed by the passage of a sound. Occlusion of the external os with retention of menses he has also encountered.

2. Patency of uterine interior. After intrauterine vaporization and after too deep curettage, the endometrial cavity may become obliterated.

3. The relation of the uterus to a tumor. .

4. The presence of an intrauterine polyp or submucous fibroid.

5. The size of an undeveloped or hyperinvoluted uterus.

If I were to criticise the above indications for the use of the uterine sound I would exclude in every case his third indication, namely, the determination of the relationship of a tumor to the uterus. If one is to depend at all upon his diagnostic skill in bimanual palpation, this manipulation would not be necessary. As to the fourth indication, the symptoms will usually be so pronounced if there is a polyp or submucous fibroid that the introduction of a sound, except just before a curettage is performed for the removal of this growth, would not be justifiable. Certainly in the routine office examination it would never be wise for one to introduce a sound merely to establish the diagnosis, for if the patient is having a malodorous or hemorrhagic discharge, it is always an indication for a much more thorough examination than is possible by means of this instrument. The patient under these circumstances should be at once referred to the hospital for a diagnostic curettage. As to the fifth indication, likewise, there is very little argument in favor of the use of a sound to determine the size of an undeveloped or hyperinvoluted uterus, for both conditions should be diagnosticated by bimanual examination.

[1] The Post-Graduate, July, 1904.

The contraindications laid down by Brothers for the use of this instrument are as follows. It should not be passed—

1. During a menstrual period.

2. During an acute inflammatory attack of the uterus, ovaries, pelvic peritoneum, and connective tissues.

3. In cancer of the cervix or body of the uterus.

We are inclined to lay much more stress upon the use of the curette as a diagnostic instrument than upon the sound. The latter instrument of course should never be employed except under the most complete operative precautions. The examination of scrapings obtained at curettage offers one of the most valuable means of diagnosis. Curettage must never be used alone for this purpose in the presence of pelvic peritonitis, parametric abscess, pyosalpinx, ovarian abscess, or extra-uterine pregnancy.

Another valuable method of intrauterine exploration and one little used, although long known and described, is digital examination. This, if it can be carried out, is the most reliable and surest means of exploration. In this way the presence and degree of attachment of intrauterine tumors, such as submucous fibroids and polypi, may be determined, and also intramural fibroids, so small that the curette may fail to recognize them, may thus be detected. Winter says that carcinoma of the fundus can be recognized as easily as carcinoma of the cervix when one is able to feel infiltration or ulceration of the wall. The author quotes Winter as advising in cases of uterine hemorrhage, first, the use of a sound; if roughness is discovered by this instrument, curettage should be performed and the scrapings examined histologically. If these fail to reveal the true nature of the affection, then digital examination is advisable. Furthermore, digital exploration is called for when the clinical symptoms are strikingly in opposition to the microscopic findings, as when the microscope fails to confirm the suspicion of malignancy in repeated hemorrhages; also when the microscope shows a benign intrauterine condition and recurrent hemorrhages lead to the suspicion of polypi or submucous myoma. It has been stated very truly by Keating and Coe that "in the unimpregnated uterus or where the cavity of the womb has not been dilated by disease, there is not room for the end of the finger." At any rate, in many cases dilatation of the cervix will be a necessary preliminary to a digital exploration. The author thinks this method of examination is infinitely preferable to the immediate use of the curette in puerperal fever. By the finger alone retained placenta or blood clots can often be removed—by the indiscriminate use of the curette in such cases much harm can be done.

Dysmenorrhœa. There is no symptom which is more difficult to satisfactorily cure than dysmenorrhœa, for it is dependent upon so

many causes, several of which cannot be reached by either medicine or surgical remedies. A simple dysmenorrhœa, due to stenosis of the cervix will, in the large majority of cases, be radically improved or permanently cured by a thorough dilatation of the cervix. But unfortunately this mechanical disability is productive of this symptom in only a small percentage of cases, and it is for this reason that a dilatation of the cervix, notwithstanding it may be ever so thoroughly performed, is so frequently disappointing. In that large class of cases in which the painful menstruation arises from defective development of the generative tract or from a thickened capsule of the ovary, little can be done other than to palliate the symptoms at the menstrual period. Unfortunately in many of these cases the pain is so severe that sooner or later the patient may be driven to take some powerful sedative to relieve the agony, and in not a few instances the formation of the morphine habit may be traced to this source.

Any operative measure, therefore, which offers a radical relief of this condition must be welcomed; at the same time any operative or mechanical measure must carry with it a minimum danger in the way of subsequent impairment of the health through possible infection. Because of these possible dangers we are, therefore, inclined to look somewhat askance at the suggestion for the relief of scanty menstruation, which has been suggested in the following article:

Carstens[1] speaks of the difficulty experienced in the treatment of scanty and painful menstruation. The inefficiency of medication and hygienic rules is common experience. This applies to those cases in which no gross lesion can be found to account for the symptoms. The author finds a cause for this symptom at puberty in the defective development of the uterus. With the increased tax upon the mental powers there is a correspondingly diminished nutritive supply to the pelvic organs. Another class is indicated by the following: a young woman of especial aptitude passes through her school life without the least trouble, takes exercise, and nature has no trouble at all in developing her pelvic organs. She goes on in that way for a time, does not marry, and becomes a teacher, or engages in some occupation requiring more or less sedentary habits. Dysmenorrhœa develops, and at length she presents the same set of symptoms as were observed in the other young woman at puberty. In the one case the trouble originates from a failure of the uterus to develop; in the other it results from an atrophy of an unused organ. In both cases what the uterus needs is muscular exercise, and this the author finds is best obtained by the use of the stem pessary. The uterus will attempt to expel the foreign body by con-

[1] Journal of the American Medical Association, December 10, 1904.

traction, and in this way the uterine muscle will be benefited. Such a pessary may be left in place for months or even years.

Other conditions which are also cured or greatly benefited by the use of the stem pessary are recurring stenosis, flexions of the uterus, scanty menstruation in fleshy women, and amenorrhœa caused by any of the conditions already considered. Any sort of a stem pessary will do, but the hard-rubber Chapman pessary is the best. All pelvic diseases, ovarian or tubal, must be positively excluded before this method of treatment is tried.

Leukocytosis as a Diagnostic Factor in Gynecological Cases. Leukocytosis is seldom of diagnostic value in gynecological cases. Occasionally, however, after an operation, when the temperature is atypical and nothing can be found upon palpation to explain an abnormal temperature, a leukocyte count may be of the greatest value. Thus, within the last year, in my own experience, typhoid fever has been detected twice by a careful blood examination, when the absence of leukocytes played a prominent role in the differential diagnosis, outside of the positive Widal test. While I do not lay very much stress upon the leukocyte count in the anteoperative study of cases—for only rarely, indeed, will such a differential resort be necessary—yet in postoperative cases it may be recommended with the assurance that in a given number of obscure cases it will make possible a satisfactory differential diagnosis.

Pankow[1] has carried out very careful investigations to determine the significance of leukocytosis in gynecological cases. He has taken apparently every possible precaution against error. It is not necessary here to recite his technique. It is sufficient to note that he selected his technique and his manner of investigation so as to rule out, as far as possible, errors which might occur in leukocyte estimation because of the following:

1. The normal leukocytosis after exertion or during digestion.
2. The inaccurate result from a small number of cells counted in making the estimate.
3. The unequal diffusion of the leukocytes throughout the diluting fluid.
4. The unequal number of leukocytes in different drops of the same mixture.
5. The difference in the number of leukocytes in the blood of the lobes of the right and left ears, which were used alternately.
6. The difference in the number of leukocytes in the blood from day to day.

All of these sources of error were guarded against (for particulars, see original article), and Pankow's results may be summarized as follows:

[1] Archiv f. Gynäk., Bd. lxxii., u. Berichte Gesells. f. Geburtshin Leipzig, Zent. f. Gynäk., 1904, No. 11.

A. Behavior of the white blood corpuscles in suppurative and non-suppurative affections of the adnexa and the peritoneum.

1. In all cases where repeated counts give a leukocytosis of over 10,000 and other causes for the increase can be excluded, the diagnosis of pus is justified.

2. In cases where the leukocytes are under 10,000 the diagnosis of suppuration cannot certainly be excluded, for either there may be a tuberculous infection or there may be pus which is so deeply encapsulated that there is no absorption from it, and consequently no chemical irritation is exercised upon the white blood cells.

3. There is no leukocytosis in pelvic hæmatoceles unless suppuration occurs.

4. Rupture of a pregnant tube is associated with leukocytosis, which may be regarded as a posthemorrhagic increase of the white blood cells.

5. Torsion of the pedicle of an ovarian cyst directly after it occurs results in leukocytosis. This is probably produced by peritoneal irritation.

6. Fulminating peritonitis occurs without leukocytosis. The reactionary power of the body is destroyed.

7. It may be said, especially for gynecological suppuration, that a leukocytosis is often of low degree (11 to 13,000), but even this shows more certainly the presence of pus than does the temperature curve.

The estimation of leukocytes in gynecological diseases is to be looked upon as a significant and differential diagnostic aid.

B. Behavior of the white blood corpuscles in carcinoma.

The blood was examined from 14 carcinoma patients; in 13 there was carcinoma of the uterus; in 1 there was carcinoma of the ovary. The case of ovarian carcinoma gave no leukocytosis. In 3 of the uterine cases there was leukocytosis, but in 1 of these there was also pyosalpinx. There was infiltration of the parametria 7 times; 6 times on both, once on a single side. Infiltration of the pelvic glands occurred in 6 cases; in 3 the glands were carcinomatous. There was suppuration of the growth in 7 of the cases; in 12 there was cachexia. There was no case of pyometra. Two cases of uterine carcinoma alone showed leukocytosis, but had neither infiltration of the parametrium, glandular involvement, nor had cachexia. From these facts the author says:

1. In most cases of carcinoma of the uterus there is no leukocytosis.

2. The behavior of the leukocytes is independent of the growth of the tumor.

3. Carcinomata give no leukocytosis, unless pyometra exists. (Dütz-mann.) This is probably because the necrotic masses can be easily shed and have before that been nearly shut off from the circulatory supply, so that there is small chance of absorption.

4. The estimation of leukocytes in carcinoma is of no value in judging the extensiveness of the lesion or in prognosis.

C. Behavior of the white blood corpuscles in myoma uteri.

1. There is no leukocytosis from myoma *per se*.

2. After excessive acute hemorrhage in these cases there may be a post-hemorrhagic leukocytosis.

3. Continuous small hemorrhages do not produce leukocytosis.

D. Behavior of the white corpuscles after operation.

1. After minor operations, as evacuation of abscess cavities, there occurs from the first day on a decrease in the number of white blood cells, unless there is some retention of pus.

2. When a major operation is undertaken for the removal of an abscess, there is a great increase in the number of leukocytes. This reaches its highest point on the first postoperative day; if there is no disturbance in healing, the leukocytosis progressively and slowly diminishes.

3. Disturbances in healing and stitch abscess cause a new increase in the number of leukocytes.

4. After so-called aseptic operations, as after the removal of an aseptic hæmatocele or myomectomy, postoperative leukocytosis is observed in the same degree as after the removal of a pyosalpinx.

5. The postoperative leukocytosis is not to be looked upon as a post-hemorrhagic change, because there is not enough loss of blood in the majority of cases. Neither does it result from the anæsthesia, as control experiments have shown. According to the author's views, it depends upon the unavoidable slight infection of the wound and the chemical irritation produced by the secretions of the wound.

Routine Appendicectomy as a Coincident Part of Other Abdominal Operations. We have recently discussed the propriety of the coincident removal of the appendix when the abdomen is opened for some other cause. This question is one which has been open to discussion, and while, so far as my own opinion is concerned, I am inclined to favor the removal of the appendix, nevertheless, it should not be laid down as a cardinal rule for all cases, but should be subject to the patient's opinion.

Peterson, who has already discussed this question, and has taken the position that it is proper to remove the appendix as a routine measure, sustains his argument by the pathological findings in his cases. In my own experience the pathological examination of appendices removed in a considerable series of cases bears out Peterson's observations.

In a recent article upon this subject,[1] I have made the following statement:

"The medical profession has long since ceased discussing the question

[1] Unsettled Questions in Abdominal Surgery, American Journal of Obstetrics, 1904, No. 5, vol. xlix.

of the removal of the appendix in acute appendicitis; but concerning the removal of the apparently normal appendix in the course of another abdominal operation there has, however, quite properly been considerable doubt. To accurately determine this question one must decide: first, whether the mortality from abdominal operations in which this plan has been pursued is greater than in the same class of operations without appendicectomy; and second, what proportion of these presumably normal appendices has shown actual evidences of disease when subjected to histological examination. However, before taking up these points, the median incision as a route through which to reach the appendix may be considered. So far as my own experiences is concerned, the appendix may quite as easily be removed in the largest majority of cases through the central as through the incision directly over this organ. When the symptoms are unquestionably those of acute appendicitis, epecially where drainage may be a necessity, it is undoubtedly wiser to make the incision at McBurney's point, but as my paper deals solely with the associated operations, it is only necessary to consider the approach to the appendix for purposes of inspection and removal through the median incision.

"Either one of two plans may be instituted for quickly locating the appendix; the first of these is by touch. The acute angle of the ileum at its junction with the cæcum is usually the best guide when the attempt to locate the appendix by touch is made. With the finger hooked beneath the cæcum it is swept around this organ to the ileum, which is lightly grasped, and thus the cæcum may be drawn up into the wound, which at once brings into view the anterior longitudinal band, and this unerringly guides one to the appendix if it is followed persistently downward. When the cæcum is anchored by adhesions, this manœuvre may not be successful, and then the abdominal incision is lightly lifted upward with the retractor, when the cæcum may be located by sight, and with blunt forceps gently draw forward into the wound. In all abdominal cases, when the patient is intelligent, I am guided by her decision relative to the removal of the appendix. To this class of cases I usually state my personal position, namely, that if I were to have a cœliotomy performed for some other condition, I would instruct my surgeon to remove the appendix, but to free myself from exercising any undue influence, I further state that the dangers of the operation are slightly increased by this extra operation.

"According to this rule, in 120 cœliotomy cases in the University Hospital, in which some other disease formed the primary basis for operation, the appendix was removed. Pathological examination of these cases shows the following:

Normal appendices	25
Periappendicitis	39
Appendicitis, catarrhal (15 mild, 3 chronic)	18
" chronic (4 mild)	13
" obliterative	8
" acute	4
Hyperplasia of lymphoid elements in appendix	2
Appendicitis, mild acute	3
Fecal concretions in appendix	5
Appendicitis, interstitial	1
Carcinoma of appendix, primary	1
Pressure atrophy of the appendicular mucosa due to kink	1
Constriction due to previous catarrhal disease	1

"Thus it will be seen that while the largest proportion of these appendices were looked upon at the time of the operation as essentially normal, there were nevertheless a large number which were either inherently diseased or were inflamed as the result of association with inflammatory lesions in the pelvis. Thus 39 cases of periappendicitis were noted, 4 of acute appendicitis, and 1 very rare condition, a very early primary cancer of the appendix. In the latter case the patient was operated upon one year ago, and as yet there has been no evidence of a recurrence of the cancer. From this table it would appear, therefore, that the routine removal of the appendix as a coincident part of another abdominal operation is based upon a very appreciable pathological basis. If we were to make a comparative prognosis in these 120 cases with and without the removal of the appendix, there can be no question but that the ultimate mortality, and especially the morbidity in the same cases with the appendix left, would be very much greater than those without it.

"In this series of 120 cases only 1 patient died, and this death came from causes in no way attributable to the operation upon the appendix. Therefore, so far as the direct influence of the appendicular operation upon the recovery of the patient is concerned, it may be said not to have produced one single death. If, on the other hand, these cases were to have been discharged from the hospital without this additional operation, one dare not say that any such future possibilities for perfect health could exist; for there were 39 cases of periappendicitis, some of which would have inevitably produced more or less disability. There were 18 cases of catarrhal and 13 cases of chronic appendicitis, some of which would, sooner or later, certainly have become suppurative. Four were acute, which doubtless would have given rise to serious symptoms or even death of the patient during the immediate convalescence from pelvic operation. While the case of primary carcinoma of the appendix was an accidental discovery, and as it would not probably occur again in 1000 cases, it should hardly be considered a statistical possibility; nevertheless, this patient's life was saved by the removal of this organ.

"If, therefore, I had been in doubt before as to my personal rule concerning the removal of the appendix as an associated operation when the abdomen is opened for other causes, I would unqualifiedly declare in its favor, and would sustain this declaration by the foregoing pathological data."

Reuben Peterson,[1] who first advised the uniform removal of the appendix as a coincident part of another operation, believes, unless there is a distinct contraindication, that a thorough examination of all the abdominal organs should be made when the abdomen is opened. There is scarcely any contraindication to an examination of the vermiform appendix, and no surgeon will deny that this organ should be removed if diseased, provided this additional operation does not jeopardize the patient's life.

Peterson draws attention, however, to the difficulty experienced at times in deciding macroscopically whether a given appendix is diseased or not. The significance of the size and shape of the appendix, as well as the presence or absence of adhesions, constrictions, fecal concretions, etc., are yet not well understood. For the purpose of studying this question, Peterson has carefully observed 200 cases of appendicectomy in conjunction with some other intra-abdominal gynecological operations. No case is included in which the symptoms pointed primarily to the appendix. The organs were examined carefully in each instance and then compared with the findings upon histological examination in the laboratory. To show the carefulness with which the histological diagnosis was made in each case, it is only necessary to state that in all cases in which the appendix did not appear classically normal and yet did not show conclusive evidence of inflammation, it was classed with the appendices of doubtful significance.

The histological classification and the number of cases in each may be shown in the following table:

	Cases.	Per cent.
Negative	65	32.5
Chronic inflammation	57	28.5
Doubtful significance	41	20.5
Former inflammation	28	14.0
Acute inflammation	6	3.0
Periappendicular inflammation	3	1.5
	200	

It will be seen from this that 94, or 47 per cent., of the appendices showed a histological lesion. Comparing the gross findings with the histological, we see that the appendix was adherent in 18.5 per cent. of cases, and that adhesions were twice as frequent in those cases proved by

[1] American Journal of Obstetrics, July, 1904.

the microscope to be the seat of past or present disease, as in those cases where the appendices were found to be normal. However, in 6.1 per cent. of the normal appendices adhesions were present. The shape of the appendix was abnormal in 26 per cent. of the cases. Comparing this abnormality of shape with the histological diagnosis, it is found that the mere shape of the organ serves as no index of its histological structure; thus, out of the 52 cases in which the appendix was noted as being club-shaped or bent upon itself, in 27 instances there was no disease of the organ; in the remaining 25 there were various degrees of inflammation. Fecal concretions were noted in 8 per cent. of the cases (this means palpable microscopic concretions); 8 of these cases appeared normal histologically, and 4 showed inflammatory changes.

The author quotes further the association, as he has found it in his series, between the various forms of uterine and adnexal disease and inflammation of the vermiform appendix. The conclusions which he reaches are in part as follows:

1. A little more than 50 per cent. of appendices removed during the course of operation for pelvic disease will be found microscopically to be normal.

2. The remainder will show forms of acute or chronic inflammation as the result of former inflammation.

3. Menstrual pain may be due to or enhanced by the presence of an inflamed appendix. The congestion incident to menstruation increases the inflammation and gives rise to attacks of appendicular colic.

4. The appendix is adherent twice as frequently in those cases where microscopic examination shows past or present disease. A certain proportion of adherent appendices are, however, perfectly normal microscopically.

5. Mere shape of the appendix cannot serve as an index of its normality or disease. Appendices may be club-shaped, constricted, or bent upon themselves, and yet be perfectly normal microscopically.

6. The appendix is the seat of fecal concretions in at least 8 per cent. of all cases. Their existence does not denote that the appendix is diseased. The removal of an appendix, however, containing one or more such concretions is justifiable on the ground that their presence is a source of danger in predisposing to disease.

7. Nearly 50 per cent. of patients with chronic disease of the appendages show accompanying disease of the appendix.

8. Systematic examination of a series of removed appendices shows the occasional presence of primary carcinoma in such an early stage that it could not have been determined by inspection at the time of operation.

9. It is impossible to say by gross appearance alone whether the appendix is diseased, and, since nearly 50 per cent. of appendices in cases of

laparotomy for pelvic disease are the seat of pathological lesions, the surgeon's duty is to remove the appendix in every case, if there are no contraindications. Otherwise he will leave behind diseased appendices which may prove a subsequent source of suffering to the patient.

The Dangers of Pelvic Examinations. A timely warning has been offered by Kelly against the rough examination of patients. In many instances, frequently even with experienced physicians, the very roughest manipulation will be instituted in making a pelvic examination; and when one takes into account not only the dangers which may arise from traumatism but more especially the actual discomfort which is suffered, it is surprising that more accidents do not occur than are reported. The most skilful diagnostician will not use extreme force in making an examination, for he will detect infinitely more by a gentle than by a heavy touch. In a rough examination the pain experienced by the patient will probably defeat any possibility of making a satisfactory diagnosis, and quite naturally under these conditions the greater the pressure the greater the dangers to the patient. A cardinal point, therefore, which should be insisted upon by every teacher in gynecology, is the necessity for developing gentleness in the examination. On the same principle that the blind man will read the finest elevated print by merely lightly passing his finger tips over the elevation and will probably fail if heavy pressure is made upon the print, so the same will occur in any diagnosis where the sense of touch is involved.

In the following article Kelly[1] reminds us that the dangers which patients experience are not alone those incident to the modern aggresgive operation. The preliminary gynecological examination itself may be dangerous. An injury brought about by this means may be the result of a too vigorous examination or the result of abnormal delicateness of the structures involved in the palpation. As a consequence of one or both of these factors it is not infrequent to rupture a thin-walled Graafian follicle cyst of the ovary. Other cystic collections may be ruptured which are of a more serious nature; thus, a papillomatous cyst, a cystic sarcoma, an extrauterine pregnancy, a pyosalpinx—any and all of these have been ruptured during examination, with more or less serious results.

It is rare to find an injury to the abdominal or vaginal wall as a result of the examination, although the tissues of the abdominal wall have been bruised during an examination. Kelly has never seen anything like a distinct hæmatoma or abscess produced in this way. The tough musculomembranous wall of the vagina shows little effect from the pressure of an examination. The most delicate of the structures

[1] Journal of the American Medical Association, November 26, 1904.

lying between the palpating hand and the intrapelvic disease is the rectum with its musculomucosa. Kelly reports 4 cases in his own service in which the examining finger was actually thrust through the rectal coats into Douglas' cul-de-sac. The accidents either happened in his own hands (1 case) or in the hands of careful and competent assistants (3 cases). The cause of the injury lies in the age of the patients (in 3 averaging fifty-seven years) and the weakened muscular tone of the bowel. In one it is significantly noted that the patient was very stout. Hence, it is quite possible that especial effort had to be made to reach the pelvic structures and that the tissues were more friable.

As a safeguard against the accident Kelly would recommend the utmost gentleness in rectal palpation, especially in stout, elderly women. It is a good plan, he says, to empty the bowel before examination, place the woman in the knee-chest position, and distend the rectum with air. Upon returning the patient to the dorsal posture it will be found that the rectum by this distention has applied itself to the pelvic structures. The examiner should carefully avoid invagination of the ampulla, thus pushing it up to a higher point than normal; he should pass the finger beyond the rectal valves, behind the cervix, the so-called "third sphincter," and then up into the pelvis. The rectum at this point lies normally in contact with the posterior surface of the uterus and the left broad ligament. In case a perforation of the rectum occurs, it is proper to immediately open Douglas' cul-de-sac and suture the bowel from the peritoneal side. Drainage through the posterior vaginal incision should then be instituted. If the perineum and vagina are rigid and contracted, or if for any reason the rent is difficult to expose by this route, or if the abdomen is about to be opened for another purpose, it should be repaired through the superior strait. In either event drainage should be established through the vagina.

It is of great importance that the sutures are well placed, passing through the serous, muscular, and subserous coats as far as the mucosa, and that they secure accurate apposition. After such an operation the patient should be kept on albumen-water for five to seven days. The anal orifice should be thoroughly dilated and a rectal tube kept in place, in order to carry off gases and keep the parts at rest.

Tuberculosis of the Urinary Track in Women. Up to the time of the invention of the various forms of the cystoscope, very little had been done in the diagnosis and treatment of tuberculosis of the genitourinary track. While this invention has not solely been responsible for the improvement in diagnosis and operative treatment of these cases, nevertheless it has greatly stimulated their careful study. As will be pointed out in the following article, it is possible to make a diagnosis of tuberculosis of the kidney without the use of the cystoscope; but one must

not depend solely upon symptoms in reaching this end, for the various clinical methods of scientific precision must be employed, if the case is to have the most thorough study. While the bacteriological study of the urine in tuberculosis of the genitourinary track is oftentimes negative, if, as pointed out by Hunner, daily examinatons of the urine are made, sooner or later the bacilli will be found.

In the following critical summary the various clinical points bearing upon tuberculosis of the genitourinary tract have been so clearly brought out as to require little or no comment.

The subject has been very thoroughly studied by Hunner[1] in his review of 35 cases of tuberculosis of the urinary system in women. From his study he finds that this is a disease of young adults; 20 of the 35 cases were only thirty years old or younger. The average age at the time of treatment was thirty-two and a half years.

A family history was obtained from 28 of the cases, and in 13 there was a history of tuberculosis. Hunner draws attention to the ease with which significant facts may be overlooked in the inquiry concerning a tuberculous family history. The patient may not know of any tuberculous tendencies, yet careful questioning may elicit information that points directly to diseases which may have been of a tuberculous nature.

In four cases there had been previous illnesses which were probably tuberculous in nature. Furthermore, there were five cases in which there was a history of a previous disease which may have left the kidneys a "locus minoris resistentiæ." In 2 of 5 cases of scarlet fever there appears to have been a definite association between the two infections. The past history may also be interesting in that it serves to show that sometimes the patient has been treated for the tuberculous lesion of the kidney under a mistaken diagnosis. Thus one case had been treated for nine years for a supposed malaria; chills and fever were her most pronounced symptoms. In another case the right kidney had been suspended six months prior to left nephrectomy for supposed Dietl's crises. Other patients had been treated for appendicitis, rheumatism, and la grippe. Hunner himself mistook one of the reported cases, two years before a correct diagnosis was made, for a floating kidney.

In the clinical history the duration of the disease and the probable seat of origin in the urinary system are especially to be noted. The extremes of existence of the symptoms were two months and seventeen years. The original seat of the lesion appears most often to have been in the kidneys, even though the first symptoms were referable to the bladder (as they were in 17 out of the 35 cases). A close scrutiny of the histories and comparison with the clinical and pathological findings

[1] Johns Hopkins Hospital Bulletin, January, 1904.

has convinced Hunner that in by far the great majority of cases urinary tuberculosis in women originates in the kidneys. Making the widest allowance for its possibility the author has classed but 5 of his 35 cases as primarily located in the bladder.

The general condition of the patient varied considerably; while some of them presented the picture of health, others appeared almost moribund. Although the care the patient has received, her hygienic surroundings, freedom from care, etc., influence her general condition to a degree, those patients are most effected in whom the kidney does not drain freely all the time (attacks of pain, chills and fever periodically), or in whom there is such irritability of the bladder at night that the patient gets but little rest.

The physical examination is also of interest with regard to the question of tuberculosis elsewhere in the economy. In 9 of the cases tuberculosis probably existed in other parts.

Although cystoscopic examination is of the greatest use in the diagnosis and treatment of this disease, the physician is not excused from making a diagnosis without this assistance. A careful history alone is of great service. Pain in the back, side, or inguinal region, together with a disturbance of the bladder functions, leads one to suspect some kidney disease. The kidney is usually palpable and tender. Palpation over the course of the ureter as it crosses the brim of the pelvis often elicits tenderness and a desire to urinate; or the thickened ureter may be felt in this region. By vaginal palpation thickening of the bladder or of the ureter may be determined. By rectal examination the ureter can be followed well out toward the pelvic wall. Although these local conditions may be caused by other infections than tuberculosis, the latter is their most common cause. The tuberculin test may afford further help in establishing a diagnosis. The signs of tuberculosis in other organs weigh heavily in favor of tuberculosis here. Examination of the urine is the only positive means of making a diagnosis. The author holds that tubercle bacilli should be found in the urine in practically every case of kidney tuberculosis. The best means for their detection is not, as some have urged, by the examination of 20 to 30 slides a day. Better than this is the examination of 1 or 2 slides daily and in the course of a week there is likely to be a shower of bacilli, marking the recent breaking down of a focus of the disease.

It should be borne in mind that sometimes when the patient feels the worst (pain, chills, fever) the urine may be perfectly clear (blocked ureter). A differential stain to exclude the smegma bacillus should always be used. When the tubercle bacilli are not found in this manner a guinea-pig should be injected. In the series of cases reported, tubercle bacilli were found in 15 out of 22 cases in which the examination was

made. It remains to be said that the cystoscope is, in the hands of those accustomed to its use, a valuable instrument in determining the condition of the kidneys, ureters, and bladder, and in deciding what should be done, and in what order.

Hunner strongly protests against catheterization of supposedly healthy kidneys through a bladder known to be infected. Catheterization of the supposedly healthy side is not necessary. The end of the speculum held under this ureteral orifice will in a few minutes collect enough urine for a satisfactory examination; or the diseased side may be catheterized and the bladder washed out, allowing the urine which then collects there to represent the healthy side. "One becomes accustomed," says Hunner, "to make due allowance for the few pus cells and epithelial cells that may have been left in the bladder after the washing, or that may come from the bladder ulcers during manipulation."

TREATMENT. This was surgical in all of Hunner's series. He is very skeptical concerning the topical treatment of vesical tuberculosis, for he has yet to see a case recover without the use of the knife. He has had in the last six months some experience with Caspar's method of treatment (small bi-weekly instillations of mercuric bichloride, 1:10,000 to 1:1000) and is somewhat encouraged in the belief that it may be useful. The operations performed were as follows:

Simple nephrotomy	3
Nephrectomy	9
Nephrectomy and partial ureterectomy	7
Nephroureterectomy	13
Nephroureterocystectomy	3

The author is disinclined toward the latter operation because of the good results following nephroureterectomy, and because in the great majority of cases the bladder condition will clear up after removal of the primary cause. He recommends for the perfomance of this operation a double incision, one lumbar and one inguinal, with a preliminary resection of the twelfth rib. The resection simplifies very much the exposure and control of the bloodvessels.

Hunner finds from an analysis of his cases that tuberculosis of the ureter exists in a large proportion of cases of tuberculosis of the kidney; also that a wound may close rapidly after the partial removal of a tuberculous ureter or it may suppurate for years after the complete removal of a non-tuberculous ureter; but that in general the partial removal of a tuberculous ureter is followed by months or years of suppuration, while the complete removal results in rapid closure of the wound.

SUMMARY OF RESULTS.

Not heard from	1
Deaths	5
Tuberculous infection of other kidney	2
Bladder symptoms still persist	13
(11 of these, however, are in good health.)	
Entirely well	9
Recent cases, with colon bacillus infection of remaining kidney; feel very well	2

The author closes his paper with these conclusions:

1. Urinary tuberculosis in women is a disease of early adult life.

2. It is usually primary in the kidney, although about half of the patients complain first of bladder symptoms.

3. It is confined to one side in the vast majority of cases. If involving both sides, a very painstaking examination must be made of the separate urines to determine whether the treatment should be surgical or medical.

4. The disease should be kept in mind in dealing with any symptoms referable to the urinary tract; even such common occurrences as a supposed movable kidney or incontinence of urine should be carefully investigated.

5. Appendicitis and gallstone colic must be differentiated. Any obscure or atypical case of supposed malaria or typhoid fever should remind one of this disease.

6. The disease is compatible with a long life of comparative health, and macroscopic and microscopic examination of our specimens show that in some cases there is a tendency to spontaneous healing; but in spite of these two facts a careful study of these 35 cases shows the disease to be pre-eminently surgical.

Postoperative Cystitis. Among the extremely disagreeable and very painful sequels to gynecological operations is postoperative cystitis. As has been pointed out in PROGRESSIVE MEDICINE, this inflammation is not a general one as a rule, but is usually located at the trigonum. Although it may not be general, nevertheless the pain is quite as acute, and is very distressing to the patient. In some cases, notwithstanding the most careful precautions which may be observed in the technique of catheterization, this complication will arise. Any suggestion, therefore, as to its treatment will be welcome to every abdominal surgeon.

In the following article special stress has been laid upon the dangers of cystitis following hysterectomy for cancer. Sampson, of the Johns Hopkins Hospital, has also laid great stress upon this complication, and has recently advised the establishment of a vesicovaginal fistula in every case before a radical hysterectomy in order to avoid it. By this means he claims that patients are made comfortable and that sub-

sequently the fistula may be closed without difficulty, and thus a complication which may even terminate the patient's life in addition to making her most miserable may be avoided.

Baisch[1] reports a case in which, following panhysterectomy for carcinoma, a patient died at the end of fourteen months from a progressive postoperative infection of the bladder. He thinks that some deaths are due to such a condition even when they are supposed to be the result of recurrence of cancer or intrauterine affection.

Since systematic rinsing of the bladder after each use of the catheter in Doderlein's clinic, in 31 cases of carcinoma operated upon by the Wertheim method, there has not been a single case of cystitis; this in view of the fact that some of the cases required regular catheterization for eighteen days after the operation.

Adrenalin in Internal Hemorrhage. From time to time during the last three or four years articles have appeared lauding the value of adrenalin in the control of internal hemorrhage. While as yet a positive judgment as to its value cannot be offered, nevertheless the evidence thus far does not bear out the rosy forecast made in its favor. In my own experience I have very systematically employed adrenalin or the extract of the suprarenal gland for the control of atypical uterine hemorrhages, not incident to structural but more to vascular changes such as are frequently noted in women about the time of the menopause. So far as my own experience is concerned, I have not as yet been convinced that this remedy works any very material benefit in these cases. In a few instances, however, of very profuse bleeding, which were not dependent upon any demonstrable pathological lesion, the direct injection of adrenalin solution into the uterine cavity has proved of signal value, controlling almost immediately the excessive flow. In one case especially, where a patient had been curetted three times by various operators without any benefit, and in whom no serious structural defects were discovered by my examination, the flow could almost immediately be checked by the injection with a Braun's uterine syringe of 1 drachm of a 1:4000 solution of adrenalin directly into the uterine cavity. After four or five periodical treatments the menorrhagia grew rapidly better, and finally gave the patient no further trouble.

In the following articles experiments have been instituted which prove that larger doses of adrenalin may be given than are usually recommended by text-books upon materia medica.

Simonovitch[2] found that dogs and rabbits tolerated large doses of

[1] Zent. f. Gynäk., 1904, Nr. 12; Abstract, Journal of the American Medical Association, April 30th, 1904.

[2] Russkii Vratch, 11, 24; Abstract, Journal of the American Medical Association, January 23, 1904.

the drug by the mouth without general effects. Human subjects also took five times the usually accepted largest therapeutic dose without showing any general effects, not even a single subjective symptom. No general effects were observed in the animals, even after the intestines had been intentionally injured. Absorption of adrenalin into the blood through the mucous membrane of the alimentary canal must, therefore, be a very slow process. The inference is obvious that it can be ingested with impunity and hence may be found extremely valuable in cases of internal hemorrhage. Its local action as an internal hæmostatic will be enhanced by giving it in small repeated doses rather than large single ones. The animals in his tests took 0.015 to 0.03 gm., and the human subjects five times the usual dose of 0.01 gm. He made comparative tests with potassium iodide, which passed into the urine in half an hour, while the adrenalin could not be detected in the blood. The general effects were realized only when the adrenalin was injected directly into a vein. This is allowable to revive the heart only in desperate cases as a last resort, owing to the danger of paralysis of the heart which occurred in a number of his experiments on animals.

Fenomenow[1] has found that adrenalin affects differently the various parts of the mucosa of the genitalia, the same as its action is different on the mucosa of the nose, throat, and larynx. It does not seem to affect the mucosa of the vagina, but has a pronounced action on that of the uterus. He even found that ischemia was marked throughout the entire uterine mucosa when the adrenalin was applied to the cervix alone. He was able to curette the uterus with a minimum loss of blood after merely tamponing the cervix with gauze impregnated with a 0.2:1000 solution of adrenalin. This difference in the response to adrenalin between the mucosa of the vagina and of the uterus could be noted in the same subject.

Appendiculo-ovarian Ligament. From the anatomical standpoint there have been two or three interesting articles within the last few years on the appendiculo-ovarian ligament. Clinical advantage may be taken of this close relationship in the differential diagnosis between a tubal inflammation and appendicitis. In inflammation of the tube, if the cervix is tugged upon, the patient will complain of pain low down in the pelvis, in the region of the ovary or tube, whereas if the appendix is acutely inflamed and this same diagnostic manœuvre is instituted, the patient usually experiences the greatest pain about McBurney's point.

In the following article Craig[2] has pointed out new possibilities concerning this ligament, for he claims that in some instances it is inflamed

[1] Semaine Médicale, xxiii. 49; Abstract, Journal of the American Medical Association, January 9, 1904.

[2] Journal of the American Medical Association, November 12, 1904.

and gives rise to characteristic symptoms of pain and dragging, which are not explained by any irritation or inflammation of the appendix or of the tube or ovary. He has observed a series of 6 cases which directed his attention to the clinical importance of the so-called appendiculo-ovarian ligament. After mentioning the various titles under which this structure has been known, the author agrees with Nagel that it has no definite or constant relation to the appendix, and is simply the upper or suprapelvic portion of the infundibulo pelvic ligament, and exists on both sides of the pelvis. If this is correct then the lymphatic connection between the uterine appendages and the appendix is more or less accidental, and depends entirely on an anastomosis between the vessels of the appendix and the ovary. The author does not believe there is necessarily any clinical relation between the right uterine appendages and the appendix. He has observed 6 cases, clinically, in which this suprapelvic or extrapelvic part of the infundibulo pelvic ligament was thickened and tender, and in which there was relief of symptoms following the excision of a V-shaped piece. The cases had several points in common which, says Craig, may serve as diagnostic guides in the future.

1. Tenderness starting high up in the right iliac region and extending continuously down to the true pelvis.

2. Sense of dragging in the iliac region.

3. More or less pronounced displacement of the uterus to the side of the affected ligament.

Although all of the author's cases were confined to the right side, he sees no reason why the left ligament also should not be affected. The fact that in all but one of his cases the appendix was normal and on being left in the abdomen has given rise to no symptoms, seems to negative the tentative opinion that the existence of the appendix on the right side makes that ligament more liable to irritation. In all six of the cases Craig believes the condition of the ligament was an important clinical factor, and in 3 cases it was apparently the only disease-producing factor.

The Ravages of Gonorrhœa in Women. As is well known, previous to Noeggerath's epoch-making paper, little or no stress was laid upon this disease as a serious factor in the ailments of women. In discussing the sterility of women it was not even alluded to. For the last two decades, however, its dangers have been more and more dwelt upon, until perhaps they have been exaggerated. Nevertheless, the fact remains, as pointed out by Bumm, that it is a tremendous factor in the permanent impairment of women's health. In the following articles the rather exaggerated dangers may perhaps be compared with the more conservative statements made by Bumm in his article on sterility in women.

Johnson[1] believes that there is no disease of modern times that has caused as much indirect mortality, mutilation, and suffering as gonorrhœa. He quotes Morrow, who says that while syphilis has a more devastating effect upon the product of conception, there is no disease which has such a dire effect upon the health and procreative activity of woman as gonorrhœa.

It has been stated by Sutton that gonorrhœa accounts mainly for the sterility of prostitutes. That the disease plays a large factor in race suicide cannot be questioned.

Although venereal diseases destroy more lives and deplete the population through abortion and the prevention of conception than any other diseases, the fact is largely ignored by civic authorities. The author says that it has been recently admitted that gonorrhœa is more widespread than any other disease. It has been estimated that from 75 to 90 per cent. of the male population of large cities have had gonorrhœa; 5 to 18 per cent. have had syphilis. In view of these facts it is remarkable that the prevalence of this disease has not been more taken into account in its relation to marriage. Noeggerath has stated that of every 1000 men married in New York, 800 have had gonorrhœa, and that a majority of these husbands infect their wives. Morrow found that 70 per cent. of the women coming to the New York Hospital during a period of seven years with gonorrhœa were respectable women and had been infected by their husbands. Janet speaks of gonorrhœa with tuberculosis as the great pests of our age.

Noeggerath in 1876 declared that 50 per cent. of female sterility was due to gonorrhœa. In a careful study of 81 women, the subjects of gonorrhœa, he found 49 sterile and the remaining 32 bore but 39 children. Neisser believes more than 45 per cent. of the cases of sterility in women are due to the gonococcus.

Lier-Ascher found 121 women out of 227 sterile because of Neisserian infection. Kehren studied 96 sterile marriages; 30 per cent. were accounted for by the absence of spermatozoa in the male; in 45 per cent gonorrhœa was the cause.

Gruenwald, Kammera, and Crolax report 53, 83, and 40 per cent. respectively. Williams insists that 73 per cent. of all abortions are due to gonorrhœal endometritis.

It is well known that conception and childbirth may occur in the presence of gonorrhœa of the cervix and vulva, and very often the recipients of the gonorrhœal infection bear one child and in this way prove their ability to procreate. Following labor, however, there is a progression upward of the disease, and the women are thereafter sterile.

[1] Journal of the American Medical Association, March 11, 1905.

Such sterility is relative rather than absolute, and has been spoken of as "one-child sterility."

Gonorrhœa is a large factor in abortion. According to Savage it ranks with syphilis in this respect. Of 53 women with latent gonorrhœa, observed by Noeggerath, 19 aborted. Fruhensholz reported a series of 101 pregnancies in gonorrhœal women; 71 went to term; 23 aborted; and 7 were delivered prematurely. Another series of 201 pregnancies shows 161 completed, 36 prematurely delivered, and 4 aborted.

The Section on Hygiene and Sanitary Science of the American Medical Association in 1901 sent the following query to many of the leading gynecologists in this country and in Europe: "What is the proportion of cases of pelvic inflammation coming under your care which are attributable to gonorrhœal infection?"

The general average of the statistics given was 40 per cent. The mutilation, suffering, invalidism, and death caused by the ravages of pelvic inflammation need not be dwelt upon. It is too well known.

The author believes that the race suicide due to this disease, if it could be ascertained, would equal in number of lives lost from either pneumonia, tuberculosis, or typhoid fever, or maybe all of them combined

When May the Gonorrhœic Man Marry? Findley,[1] after outlining the course of gonorrhœa and agreeing with Noeggerath in the main as to the frequency and incurability of gonorrhœa, asks whether physicians are ever, and if so, when, justified in endorsing a marriage when the prospective bridegroom has had gonorrhœa. In answering this query one must bear in mind the difficulty in curing gonorrhœa absolutely, and the fact that it may persist for years without any visible signs and then transmit a virulent infection to another. "Certainly, we can never say positively that a man once infected has rid himself entirely of the infection, and hence will not infect his wife." This uncertainty, together with the suffering and misery to which a woman may be brought by this disease, and the fact that 8 per cent. of all marriages are sterile because of gonorrhœa, make the physician pause in telling a patient once infected that he may safely marry. Fritsch has said that of every 100 women who have married gonorrhœal husbands, 90 are seriously incapacitated by some gonorrhœal ailment, and the author is inclined to think this statement true. The physician therefore would do well to hesitate under such circumstances. Findley himself says he would never sanction such a marriage.

Sterility in Women. In many cases it is almost impossible to determine the cause of sterility in women, therefore, the following article by Bumm will be of especial interest, for he has very fully considered the question

[1] Cincinnati Lancet-Clinic, January 16, 1904.

of congenital and acquired sterility. In view of the fact that this writer was one of the pioneer investigators in the study of gonorrhœal infection in women, his opinion concerning this factor in the production of sterility is a very weighty one. In recent articles upon sterility, the major cause has been ascribed to this source. To the contrary, Bumm takes a very positive position that this condition arises more frequently from congenital defects than from so-called pathological changes. I have read his article with more than ordinary interest, for he has thrown light upon many cases which had hitherto been unexplainable.

The minor defects in development, such as the long, taperoid cervix or its opposite, the flat, blunt cervix, are seldom taken into account in arriving at an explanation as to the cause of sterility in a given case. Bumm's suggestions for treatment are very logical, and, if carried out in the precise manner in which he has detailed them, should give effectual results. Certainly, from the report of his own experience in the treatment of these cases he has been unusually successful in overcoming sterility. By way of caution it may be said, however, that unless the methods of treatment which he suggests for correcting structural defects in development are very painstakingly carried out and executed, with the aseptic precautions incident to any surgical operation, they may be productive of very serious harm.

Relative to *gonorrhœa* as the cause of sterility Bumm[1] draws attention to the assertion that 80 to 90 per cent. of all cases of sterility in women are due to gonorrhœa. It is at once evident, he says, that this is an error from the fact that 15 to 20 per cent. of women in maternity hospitals suffer from chronic gonorrhœa which they had contracted before conception and in the presence of which they repeatedly conceive. According to Bumm, although gonorrhœa may play the greatest role in masculine sterility, it is otherwise in the opposite sex. Two-thirds of the cases of sterility in women depend upon faulty development, the other third comprising acquired sterility, in which gonorrhœa plays a large part. Defects in development of course render a woman sterile in the very beginning of her married life. Sterility from gonorrhœa is often secondary—occurring after abortion or labor, when the infection gains access to the uterine cavity and to the tubes. The developmental defect is not extensive, and only in rare instances consists of the entire absence of a part or of the whole of the genital tract. In the majority of cases it is more an arrest of development, a persistence of the infantile or fetal stage. This condition may be associated with a poor development of the secondary sexual characteristics, but it occurs too in those who have a normal external appearance; frequently it is found associated

[1] Deutsch. med. Wochenschrift, Bd. xxx., Nr. 48.

with a robust carriage and a large, masculine-like frame and pelvis. In isolated cases the arrest in development affects the entire genital tract. The vulva is small and is situated high upon the symphysis, the labia majora are badly developed, the vagina is short, the vaginal vault is undeveloped, the uterus is tiny and hangs in marked anteflexion or retroflexion; the tubes are greatly twisted, like the tubes before birth, the fimbriæ are badly formed, and the ovaries possess less than two-thirds their normal size.

All of these defects can occur alone and confined to their particular part; thus the ovaries and tubes can be defective while the other parts are normal, or the malformation can affect the vaginal vault and the cervix. For example, the vagina may pass directly into the cervical tissue without exhibiting either an anterior or a posterior fornix; the cervix may be either cone-shaped and elongated, or exceedingly small, being sharply kinked against the uterine body. The so-called pathological anteversion combined with dysmenorrhœa and sterility depends upon an incomplete development of the uterus.

How an infantile state of the genitalia in whole or in part prevents conception is not entirely explainable. The phenomena of normal impregnation and conception remain in their minute details more or less conjectural, and so must our understanding be of the point in question.

Given a case in which the ovaries are small, the menstrual periods occur at long intervals, and the flow is scant, it may be taken for granted that ovarian activity is defective and that ova capable of impregnation are extruded only at long intervals. It is easy to see how elongated, excessively twisted tubes interfere with the passage of ova and of spermatozoa. A badly developed uterine body and endometrium may prove a bar to the penetration of spermatic particles or to the embedment of fertilized ova. The disturbances which may be produced by a faulty development of the cervix or vaginal vault are more easily understood. It is important physiologically that the vaginal vault be of such shape that it will retain semen which is deposited there for some time. The author has observed repeatedly in cases in which there is a short anterior vaginal wall and a defective fornix that even a few hours after coition there will not be a single spermatic particle in the vagina or cervical canal. Although it requires but one spermatozoon to fertilize an ovum, the latter is more apt to be met and fertilized when at least a thousand of the millions of spermatic particles deposited at each emission gain access to the internal genitalia. The shape of the cervix, even though the vaginal vault be normal, may hinder the ingress of spermatic particles. The same is true of a narrow external or internal os, although it is hard to understand why this serves as an obstruction

when the opening in the worst forms is always larger than the internal orifice of the Fallopian tube.

Alterations in the endometrium or cervical mucosa may hinder conception by either furnishing unfavorable or actually inimical conditions to spermatic ingress and life. What has already been said will indicate the infinite variety of functional shortcomings which may produce sterility. From this very fact there has been more or less haphazard treatment of these cases, with an occasional happy result. Patients have passed through the whole gamut of gynecological manœuvres from the laminaria tent to curettage and the use of a pessary. Bumm feels that every treatment should be preceded by a careful microscopic study, with a view to determine whether the spermatic particles gain entrance into the uterus; in doing this the danger of carrying gonorrhœa from the cervix to the uterine body and tubes should be carefully avoided. In the presence of an infantile uterus with perfectly developed adnexa, the author has been pleased with the results of galvanism. The positive electrode in the form of a large salt-water compress is placed upon the abdomen; the negative electrode in the form of a sterile sound is passed into the uterus. A weak current up to 50 milliamperes for five minutes is used. After this galvanization, given two to three times weekly, the uterus should be lightly massaged. After three months of such treatment the uterine body may enlarge 1.5 cm., menstruation may become entirely normal, and pregnancy may ensue. The author has treated in the past five years by this means twelve women for infantile development of the inner genitalia. Five of these women were relieved of dysmenorrhœa; two of these five were not married; three were married and subsequently conceived. In the remaining seven the menstrual suffering grew less, but conception did not occur and the uterine cavity did not increase in length. When the uterine body does not enlarge in spite of this treatment conception is out of the question, and any operation to correct a malflexion of the uterus is useless.

If the internal genitalia are normal and the difficulty lies in the passage of the seminal elements from the vaginal vault to the uterine cavity, a number of measures should be tried.

When the vaginal vault is poorly developed, regular persistent massage and the application of tampons may produce an improvement in the configuration of this part. Also the introduction of a small round or bell-shaped pessary may hinder the egress of deposited seminal fluid. In two women several years sterile this means has proved effectual.

The entrance of spermatozoa may be furthered by splitting the cervical lip posteriorly as far as the vaginal vault, or the vaginal cervix may be amputated. In either case entrance to the cervix will be facilitated. In the presence of stenosis of the internal os, the best results

are obtained by gradual dilatation. The ordinary operation of dilatation is soon followed by recurrence. The author first uses Hegar's dilators up to No. 10. Then, after an interval of fourteen days, and always directly after the menstrual period, he substituted a special instrument which he has devised very much like Kallmann's urethral dilator, and slowly dilates the inner os up to 1 cm. In this way the stenosis is gradually relieved and the callous-like quality of the stricture is destroyed, the tissues becoming normally soft. Of seven sterile women more than three years married, in whom this dilatation was effected, four have conceived in the course of three to six months.

The prospect of curing sterility caused by gonorrhœa depends upon the stage of the disease. If the infection is confined to the mucosa of the urethra and the cervical canal, there is great probability that the disease can be made to run its course without further disturbance of function, and that sooner or later conception will occur. To this end it is of the highest importance to avoid any intrauterine manipulation and to prescribe rest shortly before, during, and after the menstrual periods. When the disease has become chronic in the cervix—the canal of the latter being filled with tenacious mucopus, effectually barring the ingress of spermatozoa—it is best to split the cervix as far as the vaginal vault. This will lay free the mucosa and prevent the retention of secretion. The exposed mucosa may now also be treated locally.

Even in tubal gonorrhœa the prognosis is not absolutely bad. The infection may subside without any great structural changes. If the latter occur, massage or a suitable operation may, as it has in Bumm's hands, secure the desired result.

Adenoma Tubulare Hidradenoides Vulvæ. Under the above very formidable name Pick[1] describes a special form of vulvar tumor which, up to the present time, has not been recognized. The author has seen two cases in Landau's clinic, and there is another case reported in the literature by Schickele. The tumors are small, wart-like outgrowths, varying in size from a pea to a cherrystone; they may be soft or somewhat firm; they occur single or multiple upon the large and small labia from the thirty-fifth to the forty-fifth years of life. The surface is smooth and covered by normal or reddish skin containing fine hairs. They are freely movable upon the underlying tissue, to which they are attached in a more or less sessile fashion.

Histologically the tumor is an adenoma; it extends from beneath the corium into the subcutaneous fat. It is well encapsulated when fully developed, except at certain points where it is connected with the epidermis. This connection with the epidermis varies: either there are a num-

[1] Archiv f. Gynäk., Bd. lxxi. H. 2.

ber of malformed excretory canals which lie side by side and lead to the surface, or the epidermis shows irregular plugs of epithelium, which here and there contain a central lumen communicating with the tubules of the adenoma. The adenoma is distinctly lobulated by penetration of fibrous septa from the capsule, which, however, do not penetrate as far as the centre. The adenomatous structure of the tumor is very much more complicated in the central part, where the tubules of the various lobules anastomose, are very tortuous, and pseudopapillæ are frequent. In this area there are also regular and irregular cystic spaces, or an admixture of cysts and tubules. Branched and anastomosing canals, having an elongated or a winding form, communicate with the cystic spaces and with peripheral collecting tubules. The origin of the growth is indicated by its histological structure. The lining of the larger and smaller tubules resembles closely that of the secreting portion of a sweat-gland—viz., an inner layer of columnar cells with basal nuclei, and beneath them a longitudinal layer of spindle-shaped muscle cells. The disposition of the layers may vary but the resemblance and identity with the structure of a sweat-gland are unmistakable. This similarity is still further shown by the contents of the tubules and cystic spaces, which consist of a serous or mucoid substance, the result of actual secretion and not of epithelial desquamation. An elastic membrana propria surrounds all of the epithelial canals of the adenoma. Pick calls this tumor (cyst) adenoma tubulare hidradenoides vulvæ—in other words, an adenoma resembling in its type the sweat-glands. It originates from malformed rudimentary sweat-glands. There is also a form of adenoma of the fully developed sweat-glands—viz., hidradenoma tubulare. There are also combinations of these two forms.

A New Variety of Teratoma of the Ovary. Pick[1] recalls a case previously reported by him of an ovarian cyst which contained chorion villi and chorion epithelium. He found this condition associated with tubal pregnancy, and, after a very careful study of the specimen, he regarded the chorial tumor as entirely independent of the gravid tube. It was described as a teratoma of the ovary, containing parts of the fetal embryological envelope, and was considered the analogue of the chorioepithelial tumor found in the testicle by Schlagenhaufer. To this interpretation of Pick, Risel objected that it could not be denied that the chorioepithelial structures in the tumor might have resulted from embolic particles swept into the circulation from the tubal pregnancy. There remained but two ways, therefore, in which the existence of teratomata of the ovary containing parts of the fetal envelope (chorion) could be positively proved: first, by the presence of chorioepithelial elements in a tumor occurring

[1] Berliner klin. Wochenschrift, 1904, Nos. 7 and 8.

in a young person in whom the possibility of pregnancy could be absolutely excluded; second, by finding this chorioepithelial tissue in direct connection with some of the other products of the fetal ectoderm. To this end the author examined some of his material, and found what he desired in the tumor of a girl aged nine years. This growth, which at the time of the first examination was regarded as a medullary sarcoma and was diagnosed as such, broke up under the surgeon's hand during enucleation. Together the fragments had a circumference about equal to that of a man's head. The fragments were in part soft and pithy, and had a whitish-yellow color; in part they were hemorrhagic and appeared necrotic. Upon examining this specimen, the portion which had been previously taken for medullary sarcoma proved to contain cells which the author has positively identified as Langerhans' cells, syncitium, and trophoblast. At the time of the first examination the teachings in regard to chorioepithelioma were yet in their infancy, and these cells were not recognized. The growth at that time, however, appeared atypical, and after the diagnosis "medullary sarcoma" a question mark was placed. At the later examination tissue characteristic of the central nervous system was found, in the whitish-yellow portion of the tumor, in direct connection with the chorioepithelial elements. The final complete examination of the tumor shows it to be an undoubted teratoma, with endodermal (glands lined with goblet cells), mesodermal (sarcomatous connective tissue), and ectodermal (central nervous system and chorioepithelial tissue) parts.

Clinically the tumor was very malignant, for the child died twenty-one days after the operation. A complete autopsy was not allowed; the peritoneal cavity, however, was examined, and the viscera were found extensively penetrated and surrounded by medullary masses, in part hemorrhagic and necrotic; in part whitish-yellow. From this case and others the author concludes that the proliferation or special development of chorioepithelial cells, found in a teratoma, may produce an excessively malignant tumor. He has already demonstrated how one sort of tissue in a teratoma alone may develop to the exclusion almost entirely of the other varieties (teratoma strumosum thyreoideale ovarii). The overgrowth of chorion epithelium in teratomata of the ovary and testicle is capable of producing very malignant tumors. These growths are distinctly different from chorioepitheliomata in the sense of Marchand. In the former they bear to their host the relation of consanguinity; in the latter the relation of heredity. They may be either entirely solid or partly cystic. Pick has named them epithelioma chorioectodermale.

L. Landau[1] says that he had always had the greatest interest in malig-

[1] Berliner klin. Wochenschrift, 1904, No. 7.

nant ovarian tumors in young individuals, and had always believed that there was something back of the peculiarities of these growths that was not entirely plain. Pick has shown that in spite of the apparent characteristic carcinomatous, sarcomatous, or endotheliomatous structure of these growths, they really belong to none of the classes mentioned, but to a well-defined class of tumors occurring in the testicle and ovary; in short, to the epitheliomata chorioectodermale. Landau has had 5, possibly 6, such cases. There are two points worthy of especial mention in regard to this sort of new-growth: first, the youth of the patients; second, the excessive malignancy of the tumors. All of the patients in Landau's series, with the exception of a virgin aged thirty-six years, were between the ages of sixteen and twenty-four years: sixteen, seventeen, twenty-one, and twenty-four years. All of the patients have died but 1; she is still alive, nine months after the operation. Three patients had metastasis to the lungs.

Epithelioma chorioectodermale may be regarded, then, as a teratoma in which there are chorioepithelial elements which have developed to the exclusion of the other sorts of tissue found therein. In their metastasis they resemble ordinary chorioepithelioma rather than carcinoma, for they become distributed through the vascular and not through the lymphatic system.

It is noteworthy that the growths were unilateral in all cases: 3 of the tumors were entirely solid, while 2 contained cysts varying in size from a pinpoint to an apple. The largest tumor was the size of a man's head. The tumors were all rounded or kidney-shaped, very much the shape of a uniformly enlarged ovary, and, in addition, presented a lobulated form, with a knobby surface.

Bimanual palpation suggested a multinodular fibromyoma, but it was always possible to distinguish the uterus from the growth.

Concerning the frequency of the growth, Landau mentions 28 solid ovarian tumors removed in his clinics, which have been subjected to careful examination: 15 were fibrosarcomata or spindle-cell sarcomata; 1 was a mixed sarcoma; 2 were small round-cell sarcomata; 4 were endotheliomata, in the sense of Marchand and Pick; 5, perhaps 6, belong to the epitheliomata chorioectodermale. In other words, 15 per cent. of the growths which have been heretofore put down as "alveolar sarcoma with carcinomatous-like structures" or "endothelial tumor rich in glycogen" are really of this newly described type.

Spinal Anæsthesia. In reviewing the question of spinal anæsthesia in PROGRESSIVE MEDICINE when it first became popular, and was being rather extensively tried throughout this country and Europe, I advised a conservative policy in its general adoption until a sufficient number of cases could be collected from trustworthy sources to fully determine

the advantages and disadvantages of this method of anæsthesia. To inject a toxic solution, such as cocaine and analogous drugs, into the subdural space has, from the very start, appeared to be a hazardous procedure, for when it has once passed into this canal it is beyond the power of the surgeon to limit its effects. If, therefore, toxic symptoms become manifest he can only combat this as he would any other case of poisoning

So far as the general adoption of spinal anæsthesia is concerned, its popularity is already very decidedly on the wane, and will in all probability within a short time be a thing of the past, except in rare cases, when it may still be applied. While I am not favorable to this method of anæsthesia, it is a pleasure to review the following article by Stolz upon this subject, for he has made a most careful study of a series of over 100 cases, has developed a very careful technique, and has closely noted the untoward symptoms. He has performed all of the gynecological operations from the minor to even the most grave ones, and many of them have been most successfully carried out from start to finish under the effects of spinal anæsthesia.

In considering the various drugs which may be used for cocainization, Stolz[1] says cocaine is attended with so much risk of poisoning, and the after effects are so exceedingly distressing, that it has generally fallen into disuse. Eden made 110 experiments with eighteen varieties of injection solutions and gives the following table of the relative properties of the most usual drugs:

	Lethal dose.	Analgesic dose.
Cocaine . . .	0.01 gm.	0.0005 to 0.0001 gm.
Eucaine B . . .	0.02 "	" 0.001 "
Peronin . . .	0.08 "	" 0.005 "
Nirvanin . . .	0.08 "	" 0.04 "
Tropacocaine . .	0.2 "	" 0.02 "

It will be seen that tropacocaine is the least poisonous of all. Schwarz, Bier, Neugebauer, and Kozlowski have all used tropacocaine with satisfactory results. Stolz's own experience embraces 155 gynecological cases. For this injection he uses a trocar and canula about 8 cm. in length and 1 mm. in diameter, and two syringes with a capacity each of about 5 c.c. These instruments are, of course, carefully sterilized and dried before use. The author has prepared, moreover, each time a number of cylindrical measuring glasses marked in centimetres (1 to 8). These are capped with other closely fitting cylindrical glasses, and each of them contains the amount of the analgesic which is to be used. These glasses are sterilized by dry heat at 120° C. for at least a half-hour before using. Stolz always employs tropacocaine. The patient

[1] Archiv f. Gynäk., 1904, Bd. lxxiii.

should be upon the left side with the knee drawn up as high as possible against the abdomen, and the head depressed upon the breast. The entire lower part of the back is sterilized; the usual point of puncture is between the fourth and fifth lumbar vertebræ. The spinous process of the fifth lumbar vertebra is located by means of Baudelocque's pit, which lies directly below. From this the spinous process of the fourth lumbar vertebra is found. The index finger of the left hand is so placed on the fourth spinous process that the nail touches its lower border. One centimetre perpendicularly above or below this point the skin is analgesized by means of cocaine or Schleich's solution No. 2. The trocar and canula are entered at this point, and kept at right angles to the vertebral column and pressed forward so that the point reaches the middle line at a depth of 6 to 7 cm. The puncture is usually made on that side of the spinal column upon which the patient lies. This position of the trocar is preferable because the force of gravity assists in drawing off the cerebrospinal fluid; when the puncture is made on the upper side the fluid has a tendency to flow backward along the outside of the canula. In spare persons there is no difficulty in lumbar puncture, but in well-developed ones there is often considerable resistance in the muscles and fascia of the back. The practised hand in such cases is able to feel at a depth of 5 to 6 cm. a tense, tough membrane. After this is once passed, the needle glides forward without resistance. The trocar is now removed from the canula and almost immediately the clear cerebrospinal fluid is expelled either in a stream or in drops. This is received in one of the measuring glasses. The flow is assisted by having the patient cough or by raising her to a sitting position. Gently pulling the canula forward or pushing it backward may relieve an obstruction to its lumen caused by nerve fibres. In case of necessity the trocar may even be reintroduced. After a sufficient amount of the cerebrospinal fluid has been evacuated, the canula is closed by means of the trocar. The tropacocaine in the glass cylinder which has received the cerebrospinal fluid is now dissolved by stirring it with a second canula attached to the nozzle of the syringe. It dissolves very quickly. The solution is then drawn up into the syringe by means of the attached canula and care is taken to suck into the syringe also the fluid in the canula itself. The canula is now removed from the syringe and the nozzle of the latter is inserted into the butt of the first canula and the injection made. It is well to see that cerebrospinial fluid will still flow from the first canula before the injection is begun. Otherwise, the canula having been slightly displaced, the injected fluid might find its way into the epidural space, and not produce the desired effect. If more than 5 cm. of fluid has been removed, then a second syringe will be required to inject the excess of

solution. The excess is drawn into the extra syringe, the first one being left in position. When the second syringe is prepared the first is removed, replaced by the second, and the injection is completed. The canula is now quickly withdrawn and the opening compressed by iodoform gauze and adhesive plaster. The first syringe may, of course, be of greater capacity (*e. g.*, 8 cm.), thus dispensing with the second one. It is, however, rather unusual to use more than 5 c.c. of the solution. Beginners in lumbar puncture may strike the vertebral arch or the lateral processes of the spinal column at a distance of 2.5 cm. from the surface. In this event forcible bending of the spinal column or directing the trocar a little farther outward will avoid this difficulty. Sometimes it is necessary to attempt a puncture in the second, third, or fifth intervertebral space. In parturient or very fat women in whom much flexion of the spine is difficult, and in the dyspnœic it is often advisable to make the injection with the patient in an upright position.

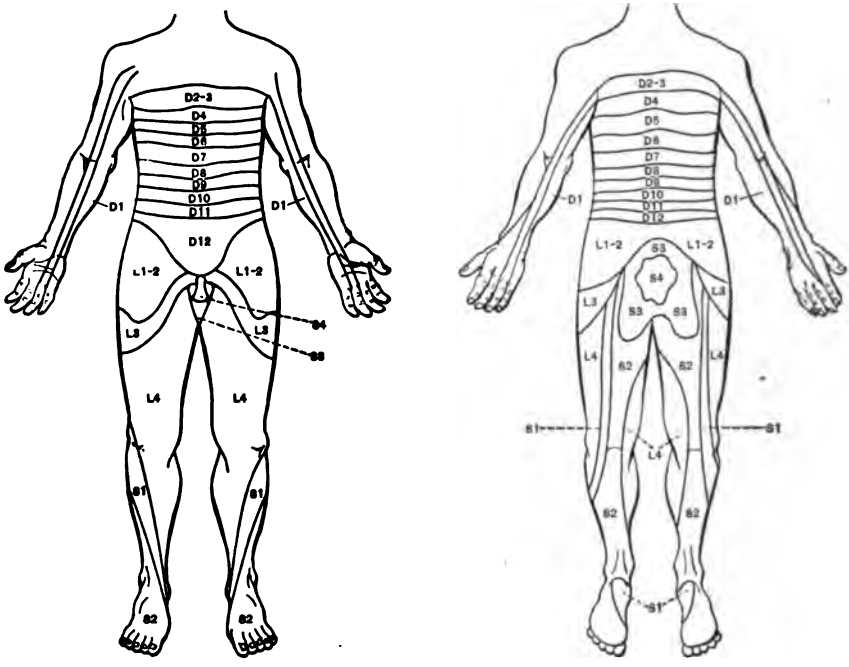
If the needle has been deeply inserted and there is no outflow of cerebrospinal fluid, it is likely that the needle has penetrated through the subarachnoid space into the vertebral body. After withdrawing the canula a little the entrance is freed and there is no more difficulty. At times nothing but dark blood flows from the canula. This denotes puncture of an epidural vessel, and that the opening of the canula lies in the punctured spot. In such an event the trocar had best be withdrawn and puncture made in another space. Even though the cerebrospinal fluid is blood-tinged, it may be used for the solution of the tropacocaine. Stolz has never seen any disadvantage from using it.

Marked œdema of the back, which obscures to a certain extent the anatomical points, may be obviated by a short period of massage. Contraction of the lower extremities during the introduction of the trocar shows that the instrument has grazed one of the supplying nerves.

The quantity of cerebrospinal fluid obtained by lumbar puncture varies considerably. According to Stolz's experience the intrameningeal pressure is almost always greater than the atmospheric. If no fluid flows out of the canula there is usually some fault in the technique. The author has found that the amount of cerebrospinal fluid used for injection is of importance because the more injected the higher will the anæsthesia reach. He takes as many cubic centimetres of fluid as there are centigrams of the tropacocaine. Thus 0.05 gm. of the tropacocaine is dissolved in 5 cm. of fluid; 0.07 gm. of tropacocaine is dissolved in 7 c.c. of fluid; 5 or 7 c.c. are the quantities generally used. When a smaller amount of cerebrospinal fluid is all that is obtainable, he is satisfied with it, except it be less than 1 c.c. even after puncturing the second time. If this happens spinal analgesia must be abandoned. Directly after injection of the tropacocaine local preparation for the

operation should be made. During this time, in order to assist the spread of the anæsthesia, the pelvis of the patient should be slightly elevated. The anæsthesia first appears (after two to five minutes) in the genital and anal regions, corresponding to the nerve supply from the fourth and third sacral segments. Then it gradually spreads to the sacral second and first, lumbar fifth, fourth, third, second, and first, thence to the dorsal twelfth, eleventh, tenth, ninth, eighth, and seventh segment areas, as indicated by Fig. 46, taken from Kocher. In the gradual extension of the anæsthesia there is, as would be supposed, a preceding impairment of sensibility before sensation is entirely abolished. As a

FIG. 46.



rule, it requires from eight to fifteen minutes for the zone of insensibility to reach as high as the navel. When this has occurred the operation may be started. If the anæsthesia does not advance that far, then the patient must be narcotized.

With the insensibility of the skin there is usually anæsthesia of the deeper tissues—in only one instance were they so sensitive that general anæsthesia was required. Customarily, however, the benumbing of the deeper tissues occurs later than that of the skin, and once in a while it entirely fails to occur. The parietal peritoneum is usually painless, but the visceral peritoneum loses its sensation of pain later, and once in a while it fails to become insensible.

The separation of adhesions is usually accomplished without pain, even though they are extensive. Separation of the bladder is many times accomplished without the least pain. Occasionally there is slight pain, which, however, does not prevent the completion of the operation, as *e. g.*, in one case of supravaginal amputation. How complete the anæsthesia of the peritoneum occasionally becomes is shown by the painless separation of inflammatory adnexa and the enucleation of a recurrent papillomatous ovarian tumor. In vaginal operations the outer genitalia, vagina, and rectum are always insensible. The cervical canal may be dilated and the uterus curetted. Quite often the change of position of the uterus incident to this procedure causes pain even though a subsequent plastic operation and cœliotomy with separation of adhesions are accomplished without annoyance. Ligation of the parametrium produces the feeling of a strong pull downward, and in one case of curettage for inoperable cancer of the cervix the penetration of the curette into the parametrium was very painful.

The analgesia persists for one-half to one and a half hours, and then disappears in an exactly reverse order from its appearance. If the sensation of touch has been abolished it reappears before the sensation of pain. As a rule, a diminished sensibility precedes the full restoration. It will be seen that the earliest and the latest effect of spinal anæsthesia is upon the genital region, and it is here, therefore, that this form of anæsthesia is most applicable. Nervous individuals who become very excited at the preparation for operation and the spinal injection are very bad subjects; a psychical effect is unavoidable and those patients who cannot be reassured often exhibit anxiety throughout the procedure. For this reason the greatest quiet should be preserved during operation and the patient's face should be covered with a towel.

Stolz has employed the technique of spinal anæsthesia which has just been detailed in 136 cases. In 100 of these cases the operation was carried out satisfactorily; in 29 the spinal analgesia was succeeded by narcosis; in 7 cases the anæsthesia was entirely unsuccessful, and narcosis had to be employed from the very beginning.

If the various operations are grouped as external, colpocœliotomy, and cœliotomy, the results of spinal anæsthesia may be thus indicated:

	Number.	Satisfactory analgesia.	Analgesia lengthened by narcosis.	Unsatisfactory analgesia.
External operations	65	60	6	
Colpocœliotomy	16	9	7	
Cœliotomy	55	31	17	7

In the 7 unsatisfactory cases the area of anæsthesia did not reach high enough. In Stolz's cases anæsthesia of the genital region always occurred.

It may be pointed out that among the 31 cœliotomies which were carried out under spinal analgesia there were major cases, such as for instance 3 abdominal total extirpations for carcinoma, with extirpation of the pelvic glands and cellular tissue; 2 total extirpations for myoma and bilateral malignant ovarian cyst; 3 supravaginal amputations; 9 ovariotomies, etc.

It is striking that in those cases where narcosis was required to complete an operation begun under local anæsthesia, a very small quantity of the anæsthetic was required. For example, in one radical operation for carcinoma, lasting for two hours, the use occasionally of a few drops of Billroth's anæsthetic mixture was sufficient. The patient, although not complaining of pain, was at no time unconscious, and conversed during the entire procedure with the operator. In all, 2 c.c. of the mixture were inhaled. In like manner 30 gm. of ether were used to complete a total extirpation for fibroid tumor. These cases, of course, were among the most satisfactory ones, but even in those requiring the most extensive narcosis for the completion of the operation, not more than 350 gm. of ether were used.

The dose of tropacocaine was usually 0.05 gm., and the anæsthesia produced by this in the genital region usually lasted from three-quarters to one and a half hours. Abdominal anæsthesia from this dose lasts about one-half hour. After the injection of 0.07 tropacocaine the genital analgesia has a duration of one to one and a half hours; that of the abdomen about an hour. Larger doses, besides producing insensitiveness to pain, also benumb the sense of touch and the thermal sense. The disagreeable after-effects so commonly ascribed to spinal analgesia have been but rarely encountered by Stolz. Of 136 patients but 24 complained of headache. Vomiting occurred in 6 cases; in no case was it at all serious or persistent. The amount of fluid injected seemed to have no influence either upon the vomiting or the headache. In 6 cases there was a rise in temperature above 100.5° F., but this soon subsided. In no case was there infection. A number of individual complications may be noted; 6 patients complained of thirst on the first day; 1 patient complained of pain in the leg on the side where the injection was made; in another there was paralysis of this leg for several days; two patients collapsed. Both of these were in miserable condition and had carcinoma of the cervix that was just within the bounds of operability. One of them was given a dose of 0.08 gm. tropacocaine. Sixteen days later a second analgesia with 0.07 gm. of the drug was successful and vaginal extirpation was carried out.

The after-symptoms are much more marked and annoying when sterile water or salt solution are employed than when cerebrospinal fluid is used.

Local Cocainization for Minor and Major Gynecological Operations. Webster[1] has considerably extended the sphere of employment of local anæsthesia in cases where prolonged anæsthesia is unadvisable—*e. g.*, senility, nephritic, pulmonary, and cardiac diseases, anæmia, cachexia, and sepsis. He uses Schleich's infiltration solution No. 2. The solution is made about twenty minutes before using and a small quantity of formalin is added in order to diminish the risk of infection. By this method many plastic operations on the cervix, vagina, and vulva may be performed. The uterus may even be extirpated by way of the vagina. After infiltration of the vaginal fornices and opening the peritoneum, no further anæsthesia may be necessary, but if the patient complain it is a good plan to infiltrate the broad ligaments, because ligation of the parametrium is often painful.

For the abdominal incision Webster recommends an infiltration of the skin for a distance of four to five inches, and then a rapid section of the remaining structures of the abdominal wall. He has carried out various operations, such as salpingectomy, salpingo-oöphorectomy, shortening of the round ligaments, myomectomy, supravaginal hysterectomy, appendicectomy, and resection of the intestines. During the operation the patient should be cheered and encouraged by the operator, and from time to time a few drops of chloroform may be sprinkled upon a mask. This often exerts a strong suggestive influence and the patient may believe that she is deeply anæsthetized. Rarely the patient becomes so nervous that general anæsthesia must be induced. Even so, however, the amount required will be reduced to a minimum.

Webster cites a case of hysteromyomectomy for a cystic fibroid weighing 87 pounds. This operation was begun under local anæsthesia. After working for an hour the patient became somewhat restless, consequently she was given from time to time a few whiffs of chloroform; 6 drachms of this drug were used in the remaining hour and a half of the operation, during the whole of which the patient was conscious and engaged in conversation.

The author has performed difficult vaginal Cæsarean section under local anæsthesia. He thinks that in extreme anæmia and sepsis the use of general anæsthesia greatly increases the risk to patients. He has operated for ruptured extrauterine pregnancy under local anæsthesia when the hæmoglobin had fallen to 24 per cent. In severe sepsis the tendency to cardiac degeneration and to changes in the renal epithelium should stand as a warning against general anæsthesia.

In regard to the sensibility of the different tissues Webster has made the following observations: If the infiltration has been well car-

[1] Journal of the American Medical Association, vol. xlii. No. 17

ried out the incision through the skin is painless. There is more or less pain in division of the other layers of the abdominal wall, but more from division of the peritoneum. Suturing or dragging upon the latter is always painful. The separation of adhesions between viscera and the parietal peritoneum, unless very slight, is always painful, whereas separation of adhesions between the viscera themselves or between a viscus and a new-growth gives little distress. Ligation, cauterization, and division of the omentum is painless, but an unpleasant sensation is produced by drawing it downward. Unless the mesentery is dragged upon forcibly no pain is experienced by handling the intestines whether they be inflamed or not. Appendicectomy is painless, as a rule. Pulling on its mesentery or separating it from the parietes, if adherent, causes pain. The broad ligaments are sensitive, as found upon compression or ligation. The surface of the uterus is insensible to pain except at the origin of the round ligaments. Any interference with the latter structures is painful. Separation of tubes and ovaries adherent to the pelvic wall causes some distress. Slight manipulation when they are free is painless. Squeezing, resecting, or suturing the ovary causes some complaint. The bladder may be separated from the uterus without much distress. Division of the vaginal wall about the cervix during hysterectomy is painful. Whereas sponging of the visceral peritoneum is painless, of the parietal it is painful according to the degree of force employed. Slow infusion into the peritoneal cavity of hot normal saline solution produces but little pain, unless the abdomen is unduly distended. Webster's observations would seem to agree with those of Lennander, of Upsala. He concludes that all pains felt within the abdomen during operation or in disease are referred to parts which are supplied by the intercostal, lumbar and sacral nerves—*i. e.*, to the abdominal walls and diaphragm and such organs as are in near relation to these nerves or are innervated by them.

DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE SPLEEN, THYROID GLAND, AND LYMPHATIC SYSTEM.

By ALFRED STENGEL, M.D.

THE BLOOD.

Chlorosis. It is a curious fact that within the past five years publications upon this subject have been steadily diminishing in number, so that articles are now rare indeed. This is doubtless due to a more settled conclusion as to the nature and origin of the disease, and, to some extent, to an increase in diagnostic ability, which distinguishes underlying disorders producing chloroanæmic conditions. At all events, hospital and dispensary reports mention chlorosis less often than was formerly the case. Labbé[1] looks upon chlorosis as being secondary to some other affection, usually tuberculosis, nephritis, syphilis, or some gastric lesion. Where the underlying cause is hard to find, the condition is generally that of latent tuberculosis. He specially emphasizes the occurrence of chlorosis at puberty as a pretuberculous symptom, and looks upon it as important as a history of pleurisy. This is an old view of certain French authors. Undoubtedly the chloroanæmia of phthisis has often been mistaken for true chlorosis.

In view of the diminishing number of cases of chlorosis that are reported, together with the increasing attention paid to the study of tuberculosis, this observation of Labbé's, although by no means a new one, is worthy of comment. It is erroneous, however, to say that all cases of chlorosis are secondary in the sense implied by Labbé. A new series of investigations along this line would be of great value. The researches by Mircoli[2] may be mentioned here. This author found that large doses of tuberculin injected into guinea-pigs caused destruction of the red cells, while small and repeated doses caused an increase in the erythrocytes, and also the hæmoglobin.

[1] Presse médicale, 1904. No. 70.
[2] Gazz. deg. Osped., 1904, No. 70.

Pernicious Anæmia. There is still much uncertainty regarding the pathological basis of this disease. Whether we have to do with a toxin or an infection as the causal factor is an open question. Nor are the opinions unanimous in respect to the direct action on the blood—whether there is diminished production or increased destruction, or both, remains undetermined. While not so rare as formerly, cases of pernicious anæmia are so few, and the progress of the disease so irregular, that to keep the patients under observation up to the time of death is difficult; and, in consequence, well-studied autopsies are not very numerous. On this account the investigations of Gulland and Goodall[1] are of special interest. Leaving out of consideration the clinical manifestations of the disease (all were typical clinical pictures of pernicious anæmia) they report the pathological findings in 17 cases. These results are briefly given. The tongue was examined in only one case, and with no special abnormal finding. This is of importance in view of the well-known theory of Hunter, who lays particular stress on "a peculiar infective glossitis" as one of the important pathological conditions. It is unfortunate that the examinations of the tongue were not more numerous. In 12 cases careful study was made of the stomach and intestines. Atrophy was always present, but this was generally due to post-mortem change. Ulceration was present in one case, but the ulcer showed no special features. Colonies of organisms were noted in two cases. In all the cases examined large numbers of basophile cells with large dropsical granules in the protoplasm were found in the submucosa. No iron reaction could be obtained. The findings in regard to the atrophic condition are in accord with those of the majority of observers of the present time, who are not inclined to look upon gastric atrophy as the primary condition. The study of the stomach wall and the finding of basophile cells in the mucosa recall the observation of Strauss, who found a marked increase in the lymphocytes. In all of Gulland and Goodall's cases the liver showed both a fatty and a pigmentary change. Iron reaction was present in each case, but in addition there was always pigment, which was unaffected by this reaction. Necrotic areas were found situated usually in the middle zone of the globules. In 8 cases giant cells were met with resembling those seen in bone-marrow. Some of these contained pigment, and some were seen acting as phagocytes and ingesting red cells. In the spleen no marked or constant changes were noted in the Malpighian bodies. In the pulp a considerable variation as regards the cells present was met with; usually there was congestion. In a few cases the lymphocytes predominated. In one-half the cases large giant cells were present, ingesting both red

[1] Journal of Pathology and Bacteriology, January, 1905.

and white corpuscles. Giant cells resembling those of the bone-marrow, were also seen in one case. In two cases the pulp showed numerous basophile cells, some of them resembling those found in the stomach. Pigment was present in all cases in varying amounts. Usually a certain proportion of these gave the iron reaction. The kidneys showed catarrhal and interstitial nephritis in every case. In 10 cases pigment granules giving iron reaction were seen in the epithelium of the convoluted tubules sometimes in a large amount. The hæmolymph glands showed marked hæmolytic change in nearly every case. Red corpuscles, ingested by phagocytes, were noted. The amount of pigment was small, and the iron reaction slight. A large number of basophiles was a striking feature. Of 6 hearts examined, 2 were apparently healthy and 4 showed fatty and other degenerative changes, but not of extreme degree. The bone-marrow was hypertrophied in all cases, and dark red in color to the naked eye. In every case a larger number of white cells was found than had been expected, thus in only 6 of the 17 cases red cells predominated; in 5, myelocytes; in 5, lymphocytes; in 1 the myelocytes and lymphocytes were equal in number and were the most numerous elements seen. There was marked evidence of blood destruction as shown by red and white cells, which had been ingested by large phagocytes, and in 7 other cases pigment giving free iron reaction was present. Giant cells were found in all cases, but they were usually small and degenerated. Eosinophile cells were numerous in only 2 cases. Basophile cells, some having the large granules noticed in the spleen and intestines, were seen in 3 cases.

Gulland and Goodall summarize the relationship between the pathological appearance and the clinical features as follows:

1. The necrotic areas in the liver were more marked in the more chronic cases. 2. The more acute cases showed more iron in the liver, and in the more chronic cases a considerable amount of pigment, which did not give the iron reaction, was present. 3. There was a striking relationship between the acuteness of the case and the number of megaloblasts, both in the blood and in the marrow. 4. The cases which had shown most megaloblasts in the blood showed most megaloblasts in the bone-marrow. 5. There was no necessary relationship between the differential leukocyte count of the blood and the marrow type. In practically all cases, the blood showed leukopenia with a relative leukocytosis, while the leukocytes in the marrow were enormously increased both relatively and absolutely.

Their conclusions as a result of these studies are well worth recording: 1. The essential feature of the disease, and the criterion in its diagnosis, is that it is a megaloblastic anæmia. 2. The widespread evidences of blood destruction occurring in liver, spleen, hæmolymph glands, and

marrow indicate abnormal vulnerability in the blood cells, rather than a pathologically excessive hæmolytic action on the part of so many diverse tissues. 3. The accumulation of iron in the liver is due partly to the disintegration of weakened or weakly blood corpuscles by endothelial cells and leukocytes, and partly (and to a much greater extent) to storage of iron, which is the product of red blood corpuscles, which have been disintegrated by phagocytes elsewhere. This accumulation of iron in the liver is not peculiar to pernicious anæmia, and is the usual result of the abnormal amount of blood destruction. 4. There is no direct evidence of special disease in the intestine, and the intestine need not be the primary seat of toxin production, though in certain cases, notably in bothriocephalus anæmia, it probably is so. 5. In some parts of the body a toxin is produced which acts directly on the bone-marrow, interfering with normoblastic blood formation, leading to megaloblastic formation, and acting with negative chemotaxis upon leukocytes, and especially the neutrophile variety. 6. The large red blood corpuscles produced by such a marrow, perhaps as much from their size as from inherent weakness, fall a ready prey to endothelial cells and leukocytes in the "hæmolytic" organs, notably hæmolymph glands, spleen, and marrow. 7. It is quite possible that certain individuals from congenital defect in the marrow may be especially prone to the disease, as there is little doubt that the megaloblastic degeneration represents a reversion to the fetal type.

These pathological findings are much the same as those of Warthin,[1] but the interpretation placed upon them is rather different. While Warthin emphasized the hæmolysis as the important feature in the disease, and looked upon the bone changes as secondary, Gulland and Goodall look upon the blood destruction as due to the lessened resistance of the red cells, produced by diseased marrow. This is in accord with the idea advanced by Bloch, and seems to be a more plausible conception. The findings in the bone-marrow are of special interest as going to show more or less closely related pathological conditions in many of the blood dyscrasias hitherto thought to be very distinctly separated. A case of Senator's[2] is of interest in this connection: The patient was a girl of thirteen, who gave a history of an illness beginning three months previous to the time of observation. She complained of increasing weakness, occasional dizziness, increasing pallor, loss of appetite, and later vomiting after taking food. For the last two months she had frequent headache, but the vomiting was less. The chief complaint was the extreme weakness. The family history was negative, and the patient had had measles, scarlet fever, and diphtheria. She had never menstruated. When seen

[1] PROGRESSIVE MEDICINE, 1903.
[2] Zeit. klin. Med., Bd. liv. Hefte 1 u. 2.

the striking feature was the waxy pallor of the skin of the whole body, with a slight yellowish tinge. The mucous membranes were also very pale. There was no œdema or swelling of the glands. The spleen was not palpable, the liver normal in outline; lungs normal; heart normal in outline, with a systolic murmur most intense at the pulmonic, but everywhere audible; pharynx normal. The eye examination showed retinal hemorrhages, and pressure over the sternum was painful. Urine negative, and no tubercle bacilli in the sputum. The blood examination, October 4th, showed 1,040,000 red cells, 8000 white cells, 8 to 10 per cent. hæmoglobin. (Gowers.) No change was found in the red cells except poikilocytosis. A long search for nucleated cells was unsuccessful. All of the white cells were lymphocytes except an occasional polymorphonuclear cell. The patient died October 7th, the blood picture remaining the same: The autopsy revealed "general anæmia; hypertrophy of the left ventricle, together with dilatation of both ventricles and fatty degeneration of the heart muscle; anæmia and collapse of the lungs; chronic inflammation of the tonsils; splenic tumor; anæmia and fatty degeneration of the kidneys, and hemorrhages into the pelvis of the kidneys; chronic inflammation of the colon and rectum; gastritis, rarefying periostitis of the vault of the skull; microscopic examination of the bone-marrow from the sternum, rib, and femur showed only lymphocytes, no normoblasts or megaloblasts, no multinuclear leukocytes or eosinophiles. To the naked eye the marrow was dark red."

From the clinical course of the disease and the blood examination, Senator had made a diagnosis of pernicious anæmia with aplasia of the bone-marrow. From the autopsy findings, he concludes that it was really a case of medullary pseudoleukæmia. A somewhat similar condition is present in Barlow's disease. Senator's case closely resembles cases reported by Ehrlich and Grawitz, Nothnagel, Logaros and Epstein. That there is a peculiar form of *aplastic anæmia* seems assured, but the exact classification of the condition is uncertain.

As a result of his observations, Senator concludes that *lymphatic (lymphadenoid) metaplasia* occurs in (1) leukæmia, most typically in the lymphatic form; (2) medullary (myelogenous) pseudoleukæmia or in the aleukæmic preliminary stage of lymphatic leukæmia; (3) along with the other metaplastic changes (such as increased myelocytes, giant cells, megaloblasts) in mixed forms of leukæmia (lymphatic-myelocytic form), in pernicious anæmia, and leukanæmia. This lymphatic metaplasia can lead primarily to growth or disappearance of the bony tissue, and through either to aplasia of the bone-marrow. On the other hand, it can occur secondarily as a consequence of bone disease.

Aplasia of the bone-marrow occurs (1) in severe anæmias without the typical (megaloblastic) character of the pernicious (Biermer's)

anæmia; that is, in progressive aplastic anæmia; (2) in so-called Barlow's disease. This is at times curable, and stands in the same relation to progressive aplastic anæmia as the anæmias of intestinal parasites do to the pernicious (Biermer) form.

The aplasia of the bone-marrow can either be primary or secondary to bone disease, and may occur directly or by the way of lymphatic metaplasia.

Interesting as these observations are, they tend to make our conception of the subject still more confused. It is seen from the above, and from a consideration of leukanæmia, that there is a direct connection between pernicious anæmia and leukæmia, and the transformation of one into the other has been discussed by Zypkin,[1] who has been able to collect 6 cases from the literature. A study of these cases, however, shows that most of them died very soon after coming under observation, and in view of the known effect of intercurrent infection upon the number of white cells, it is conceivable that some of these cases were really leukæmia of longer or shorter duration, in which an acute disease had changed the blood picture.

The relation of pernicious anæmia to gastric digestion has long been a subject of controversy, due to the fact that in certain earlier cases a progressive anæmia was found to be associated with atrophy of the gastric mucous membrane. Stockton[2] discusses this connection or relation from observations made upon a series of 25 cases, which number comprises about one-half of those seen by him. A summary of this article has been given by Dr. Steele in PROGRESSIVE MEDICINE for December, 1904, p. 67.

SPINAL CORD CHANGES. Considerable attention has been given to the study of the nervous manifestations in pernicious anæmia, most of which can be referred to the spinal cord, and studies of the pathological conditions present in the cord are of interest. Stockton[3] in his series noted the occurrence of cord symptoms in the majority of cases. Reuling[4] reports 3 cases with histological examination of the cord, which give a fair idea of the changes met with:

Case I. A man, aged forty-six years, whose family history and previous medical history were negative. His illness dated from November, 1899, when he had an attack of fever and marked malaise, associated with severe muscular pains, which was diagnosed as influenza. The myalgia was especially marked along the spine and in the muscles of the legs. After two months he was greatly improved, but still had poor

[1] Wien. klin. Woch., 1903, No. 39.
[2] Journal of the American Medical Association, July 16, 1904.
[3] Loc. cit.
[4] American Journal of the Medical Sciences, vol. cxxvii. p. 520.

appetite and mental depression. Four months later he was taken suddenly ill with abdominal pains, vomiting, diarrhœa, and tenesmus. This was apparently due to an error in diet, and lasted only a short time. After this attacks of gastralgia were frequent and anorexia the rule. When seen in 1901 he showed the peculiar pallor of pernicious anæmia, and there were retinal hemorrhages. The nervous examination showed abolition of both patellar reflexes, the plantar reflexes being retained. There was no muscular atrophy and no disturbance of the sensation. The gait was normal. There was some ataxia of the legs. The blood examination showed 1,800,000 red cells, 7000 leukocytes, and 22 per cent. hæmoglobin. There was marked poikilocytosis, also microcytes, macrocytes, and megaloblasts. The patient died March 2, 1902, and only the cord was allowed to be removed. In all specimens there was noted a narrow strip of degeneration involving the columns of Goll and Burdach. This was most evident in the lower cervical and upper dorsal region, but extended as far down as the upper sacral cord. In specimens stained by the Van Gieson method it was seen that the degenerated fibres had lost their myelin sheaths, and very few axis-cylinders could be made out in the degenerated areas. Elsewhere the cord was absolutely normal. There were no hemorrhages, and the bloodvessels and the meninges were normal in appearance.

Case II. was that of a woman aged thirty-four years, and is interesting from the fact that the nervous phenomena seemed to precede the anæmia. She was first seen November, 1902, and stated that she had had two living children and two stillbirths, the last one being at the seventh month, and from this miscarriage she dated her illness. At this time she was confined to bed with fever, and had chilly sensations and some muscular pains, but no swelling of the joints. After seven weeks in bed she was allowed up, but still remained weak. In the early part of 1901 she seemed not completely well, but was able to attend to household duties. At this period she first noticed a sensation of cold in the right thigh, which was most marked when fatigued. Later this sensation was noted over the left thigh and buttocks, and she had at times a sensation as though a bucket of hot water was poured over the lower extremities. In August, 1901, after an accident while driving, she began to be troubled with the stomach, and with a feeling of weight in the epigastrium. She was frequently nauseated, but did not vomit. At this time she began to get pale. When seen she presented the usual external appearance of pernicious anæmia, and the blood count showed 2,000,000 erythrocytes, 9000 leukocytes, 32 per cent. hæmoglobin. In the stained specimen microcytes, macrocytes, poikilocytes, and megaloblasts, some with karyokinetic changes, were seen. The nervous examination revealed stiffness of gait, but no typical ataxia with the eyes open. With the

eyes closed there was slight ataxia. Romberg's symptom was well marked; Babinski's phenomenon absent. Both patellar reflexes were absent, but the plantar reflex was retained. There was slight dulling of sensation to heat and cold over the right thigh. No other sensory disturbance; no bladder or rectal symptoms. She died January, 1903, and at autopsy the cord and brain were removed. The cord was normal to the naked eye. Microscopic examination showed well-marked degeneration of all sections of the cord except the ninth to the twelfth dorsal and the sacral regions, which involved almost the entire posterior tract of fibres, including the columns of Goll and Burdach. As in the preceding case, the change was most marked in the lower cervical and upper dorsal regions. With the Marchi stain it was found that there was considerable degeneration of nerve fibres in the right and left lateral columns, which was evidently of recent date. The anterior portion of the cord was normal, as were also the bloodvessels, nerve cells, and meninges. There were no hemorrhages.

Case III. There is practically no clinical history. The spinal cord showed several small areas of degeneration in the anterior portion. The cause of these was probably hemorrhage, as evidenced by the presence of blood pigment, and their occurrence in the anterior portion of the cord is most likely because this portion is most vascular. Reuling thinks the hemorrhage probably due to a toxin produced in the pernicious anæmia. In discussing his second case, where the nervous symptoms apparently preceded the anæmia, he thinks that in pernicious anæmia there may be two toxins—one causing the blood destruction and the other having an especial affinity for the spinal cord fibres.

THE TREATMENT OF PERNICIOUS ANÆMIA is far from satisfactory. The usual treatment is arsenic in ascending doses, which is often attended with a distinct improvement, but this in turn is so regularly followed by a relapse, even under continued arsenic medication, that it has been questioned whether the arsenic could be looked upon as causing the amelioration of the symptoms. Many authors, notably, of late, McCrae, have laid stress upon this tendency of pernicious anæmia to show wave-like periods of betterment. This is often surprising, and a patient may become quite strong and able to carry on heavy manual work, but this as a rule is not possible for any long period of time. Grawitz[1] bases his treatment upon the theory that the disease is of enterogenic origin—that is, that it is a secondary anæmia resulting from some poison acting upon the red cells, which is usually autogenous and absorbed from the intestine. Other poisons, as lead, arsenic, morphine, etc., may produce the condition, but the autogenous toxin is most common and acts upon the blood of predisposed individuals. These cases are curable by removal

[1] Deut. med. Woch., 1904, No. 30.

of the cause without the use of arsenic. He reports cases showing the results of his method of treatment. The first patient was a woman, aged thirty-eight years, who presented the typical picture of pernicious anæmia, including retinal hemorrhages, etc., and whose illness was of acute onset. The teeth were badly decayed, the bowels sluggish, no free hydrochloric acid in the gastric juice, and the motor action of the stomach was defective. The mouth was put in good condition and the diet restricted to vegetables and cereals, all of which were mashed or in the form of porridge. The stomach was washed daily with a tepid salt solution, and lemonade given freely. Nutrient enemata supplied the necessary albumin, each one being preceded by colonic lavage with salt solution. Small doses of digitalis were given early, but no other medication. The œdema had disappeared, and the hemorrhages were absorbed by the end of the first week, and at the end of the second week the blood began to return to normal, and at the end of a month she had gained eighteen pounds. During the third week the enemata were omitted and the diet increased, but all foods given were in a softened condition. This patient was discharged apparently well, but returned within a year with pyelonephritis, from which she died. The blood did not again show the findings characteristic of pernicious anæmia. Other cases are given to show the value of treatment, two of which have been under observation for from four to six years.

As I have repeatedly stated, here and elsewhere, pernicious anæmia is a secondary condition, and, that being the case, removal of the primary cause is the first indication. If this can be done, cure is not only possible but probable. That the majority of cases are curable by the methods of Grawitz is not proved by the data at hand. Even he states that the larger number do not regain their gastric HCl, and are on that account liable to remission. To speak of a cure of pernicious anæmia when achylia gastrica is yet present is hardly permissible.

Splenic Anæmia. In last year's review this subject was not treated, for the reason that but little had been offered which had not been discussed in 1903. The past eighteen months have brought forth a number of articles which, while shedding light upon the varied conditions which may accompany or be associated with splenic enlargement, have not made the subject completely clear.

Lichty[1] was able to collect 34 cases, including one of his own. Lichty's series did not include 4 cases of Scott.[2] Since then 2 cases have been reported by Stirling;[3] 1 case by Sexten;[4] 6 cases by Springthorpe;[5] 2

[1] American Medical Association, February 20, 1904.
[2] American Journal of the Medical Sciences, November, 1903.
[3] Intercolonial Medical Journal of Australasia, July 20, 1904.
[4] Ibid. [5] Ibid.

cases by Dock and Warthin;[1] 8 cases by Stevens;[2] 1 case by Carstens,[3] and 5 cases by myself.[4] Besides these, numerous case histories have been presented which showed a splenic tumor, but in which there was a doubt as to the proper classification.

In previous publications, both in PROGRESSIVE MEDICINE and elsewhere, I have expressed doubt as to the individuality of the disease, believing that many different sorts of disease have been grouped under the name of splenic anæmia. It is, however, wise for convenience of clinical terminology to retain the name in the hope that some order may be established in the future. As evidence of the variability of the conditions which may come under the heading may be mentioned the cases reported by me:

Case I. A male, aged fifty-nine years, with a history of jaundice twenty-two years previous, and a doubtful history of dysentery, but denying syphilis and malaria, was admitted April 18, 1900. Four and one-half years previous he began to notice patches of pigmentation of the skin alternating with lighter areas, and six months previous he had a chill and fever, which were repeated at intervals of a few weeks. He complained of dizziness, weakness, and dyspnœa for the past two months. On examination the liver and spleen were enlarged, fingers clubbed, and he had osteoarthritis. The blood showed a chloranæmia with leukopenia. On June 5th he showed slight jaundice. On November 2d the liver was distinctly smaller. He died March 8, 1902. During the period of observation he had three attacks of right-sided orchitis, several attacks of diarrhœa, hæmoptysis, and fistula in ano. Pathological diagnosis showed pigmentation of the skin and jaundice, chronic splenic tumor, atrophic cirrhosis of the liver, acute lobar pneumonia, chronic interstitial nephritis, etc.

Microscopic examination of the spleen showed decided evidences of congestion and hemorrhagic processes, both of old and of recent origin, with secondary fibroid and pigmentary changes. Besides this there were evidences of a diffuse fibroid change of an irritative character. Under high powers swollen and proliferated endothelial cells were moderately conspicuous, but nowhere forming masses. The fibroid process was widespread, involving all parts of the organ. The Malpighian bodies were extremely altered. The liver showed a pronounced grade of connective-tissue infiltration of interlobular and intralobular character. The bone-marrow showed a lymphoid appearance.

Case II. Female, aged two years and eight months. Enterocolitis at

[1] American Journal of the Medical Sciences, January, 1904.
[2] British Medical Journal, October 18, 1904.
[3] Journal of the American Medical Association, October 1, 1904.
[4] American Journal of the Medical Sciences, September, 1904.

one year; little evidence of rickets; pallor, enlarged spleen, palpable superficial lymph glands, severe anæmia, at first without and later with leukocytosis; diarrhœa, terminal tuberculosis, and endocarditis; duration, one and one-half years. Autopsy: The spleen was greatly enlarged and showed numerous infarctions, either anæmic or mixed. Microscopic examination, outside of the infarctions, showed sclerosis with hyperplasia of the endothelium of the sinuses; in some places large (swollen) endothelial cells were found scattered through the spaces, and occasionally massed together. The proper splenic pulp and the Malpighian bodies were atrophied, and many of the latter converted into hyaline material. The liver showed marked lymphoidal and leukocytic infiltration between the columns of liver cells, and in areas there was an interlobular fibrosis surrounding the portal vessels, which were dilated, and here and there contained large endothelial cells similar to those found in the spleen and lymphatic glands. The bone-marrow of the femur was red in color and soft in consistence. No microscopic examination was made.

Case III. Female, aged twenty-one years, married; two stillborn children; probable onset years before; enlarged spleen, palpable superficial lymph glands, pain in left side, slight anæmia, splenectomy, postoperative pneumonia; recovery. The spleen weighed 1230 gm. after hardening. In the fresh state it showed numerous nodular projections upon the surface, varying in size from 0.5 cm. to 3 cm., the larger ones being distinctly umbilicated. These umbilications were whitish, while the remainder of the organ was red. On section the substance of the organ was seen to have been invaded by a dense growth of a pinkish-red color, the darker substance of the uninvolved spleen showing well in contrast. It was evident, upon cross-section, that the surface nodules were not separate tumors, but projecting parts of the mass occupying the larger part of the organ. The umbilications were not due to softening, but, seemingly, the fibrous tissue of the trabeculæ had prevented elevation, which had occurred around it as the result of the infiltrating process. No necrosis was found anywhere. Microscopic examination showed marked new-growth of connective tissue, forming alveoli, containing large, clear cells with pale nuclei, some of the cells containing several nuclei. Giant cells, with centrally or eccentrically clustered nuclei, were abundant in certain areas, and small numbers could be found everywhere. The lymphoid elements of the splenic pulp were inconspicuous, being crowded into zones by the alveolar formations. These alveolar spaces were rounded, and encircled by well-marked connective tissue. At other places the transition was more gradual. The Malpighian bodies were retained in some places, but were atrophied. Elsewhere they were converted into connective tissue or had become hyaline. No tubercle bacilli could be found, nor any other organisms, animal or vegetable.

Case IV. Man, aged fifty-one years, history of malaria, stunted growth, pigmented skin, clubbed fingers and toes, enlarged abdomen (tympany), enlarged spleen, slightly enlarged liver, moderate anæmia, leukopenia, diarrhœa, hemorrhage from the bowel, rectal ulceration, tendency to chills, no malarial organisms; duration at least three years.

Case V. Woman, aged forty-four years, doubtful history of malaria; enlargement of the spleen succeeded by evidences of hepatic cirrhosis (ascites), no anæmia, hydrothorax; duration two and a half years or more. This patient was under observation for more than a year. When first seen she showed only enlarged spleen, and the evidence of liver involvement appeared a long time after this.

I have pointed out that many cases classified as splenic anæmia properly belong to one of the following conditions:

1. *Progressive Pernicious Anæmia or Intense Secondary Anæmia.* The oft-cited case of Strumpell belongs to this group. Such a type of case is reported by Zypkin,[1] presenting a symptom-complex resembling both pernicious anæmia and pseudoleukæmia. The patient was a woman, aged forty-one years. The blood examination showed 2,900,000 red cells; 23 per cent. hæmoglobin; normal number of white cells, of which 54 per cent. were polymorphonuclear neutrophiles, 2.5 per cent. eosinophiles, 27 per cent. large and 12 per cent. small lymphocytes, 6.5 per cent. non-granular mononuclear cells. The spleen was enlarged, but not the lymph glands. The autopsy showed fatty degeneration and infiltration of the liver cells, and considerable atrophy of the mucous membrane of the digestive tract. The bone-marrow changes were those of pseudoleukæmia.

2. *Pseudoleukæmia.* It has been suggested by H. C. Wood, and later by Sippy, that the condition is really a splenic variety of Hodgkin's disease. This idea is now generally abandoned, but in some of the older cases reported the descriptions go to show that splenic pseudoleukæmia may be almost identical clinically with splenic anæmia. Such cases, however, are exceptional.

3 *Leukæmia.* The occasional subsidence of leukocytosis in this disease is well known, and under such circumstances the case might present the clinical feature of splenic anæmia. By some writers splenic anæmia is looked upon as an aleukæmic precursor of leukæmia. Zypkin[2] reports a case of transition from splenic anæmia into lymphocytic leukæmia, but as his patient showed malarial organisms in the blood it is open to the objection that the blood count when first seen showed no leukocytosis because of the intercurrent affection.

[1] Berlin. klin. Woch., October 19 and 26, 1903.
[2] Wien. klin. Woch., 1903, No. 39.

4. *Cirrhosis of the Liver.* Splenic enlargement is habitual in this disease, and there is a growing tendency to the belief that this is not due to mechanical congestion, but rather to the direct action of the same irritant which causes the liver cirrhosis. It might seem natural that in certain cases of cirrhosis an unusual degree of splenic enlargement was present. Cases of pronounced splenomegaly as an incident in cirrhosis, are probably rare.

5. *Hypertrophic Cirrhosis of the Liver (Hanot's Disease).* The long duration and considerable degree of splenic enlargement suggest, or even justify, the inclusion of some of the cases under splenic anæmia.

6. *Chronic Splenitis.* The greatest confusion exists in the case of splenic enlargement in children, which is common in rickets, congenital syphilis, and in the uncertainly classified condition called anæmia infantum pseudoleukæmica. In this group belongs the chronic splenitis of malaria. How far malaria may prove to be a factor in the etiology of splenic anæmia is unsettled. Cohen and Rosenberger[1] report a case which illustrates the possibility of malaria with enlarged spleen simulating splenic anæmia. The patient was a girl of fourteen, who gave a history of malaria two and a half years previous, while in Italy. She showed irregular fever, subsiding in the hospital (acute bronchopneumonia); greatly enlarged spleen and liver; melanoderma; hæmic murmur; nasal, pulmonary, and gastrointestinal hemorrhages; marked anæmia with low hæmoglobin; variable leukocyte count. Repeated examinations failed to reveal plasmodia until quinine was given, when the organism could be demonstrated. Cohen remarks that in Lichty's 34 cases there were 7 cases of malaria, and 2 of syphilis, and in Osler's series of 18 malaria had been present in 5. Osler excluded this as a factor on the ground of time.

Leaving out of consideration cases of splenic enlargement referable to the above groups, there are certain cases in which the splenic disease is so predominant that a separate group, or groups, is necessary. That cirrhosis of the liver supervenes in the late stages does not militate against such classification, as it has been shown that splenic disease may occasion a secondary cirrhosis. Conspicuous splenic involvement from the beginning warrants separate classification even when some evidence of hepatic cirrhosis is an early feature. The following varieties may be recognized provisionally:

1. *Simple Splenomegaly,* In a certain number of cases, including some described by Müller, Banti, Osler, Sippy, and others, the splenic enlargement is the conspicuous feature in the clinical history. Anæmia is not invariably present, though usually so, especially when hemorrhages

[1] American Journal of the Medical Sciences, August, 1904.

occur. The hemorrhages may be caused mechanically by the spleen, or by general conditions less readily explained, as, for instance, bleeding from the gums. Pathologically this variety belongs to the category of chronic splenitis. The lesion is essentially a fibrous hyperplasia. The endothelial cells of the sinuses may be swollen, and large macrophages be present, but these are not constant. Analogy suggests a chronic infection or intoxication as causal. The disease may persist for a long time, and death occur without additional lesions; in other cases, changes in the liver develop as a final stage, which alter the clinical picture. These differ somewhat from the former in pathology, and may, for convenience, be classed separately as:

2. *Splenomegaly with Marked Constitutional Disturbances.* A certain number of cases of splenomegaly have been described in which, in addition to the splenic enlargement, there has been a profound disturbance of the general health, causing stunted growth, clubbed fingers, osseous changes, and pigmentation of the skin. French writers have reported a group of such cases in children in which the above symptoms were associated with enlargement of the liver and jaundice. Frederick Taylor has also reported such cases. More recently this subject has been gone over by von Krannhals,[1] under the caption of congenital icterus with chronic splenic tumor. Von Krannhals reports 3 such cases, and from the French and German literature has collected 23 others. The special characteristics are splenomegaly; icterus, often congenital, which varies from time to time, but the stools are not discolored, and the urine contains urobilin, while the blood-serum shows an icteroid hue; the liver may or may not be enlarged. The disease shows an extraordinary tendency to manifest itself through succeeding generations of a family. Von Krannhals has noted that in some of the cases there has not been a sufficient distinction made between the usual alcoholic icterus and congenital icterus. The latter is always associated with a splenic tumor. This author believes that while there are many points in common between congenital icterus with splenomegaly and familial icterus without the splenic tumor, a separation of the two is justifiable. Bettmann has believed the disease to be the result of an abnormal tendency of the blood to give up its hæmoglobin to the serum, and looks upon the enlargement of the spleen as spodogenous. Von Krannhals thinks with Minkowski that the splenic tumor is primary, and attributes the assumed destruction of the red cells to the action of a toxin on the liver. Dock and Warthin[2] call attention to the possibility that the clinical picture of splenic anæmia or Banti's disease may be caused by a stenosis of the portal vein resulting from an old phlebitis.

[1] Deut. Archiv f. klin. Med., Bd. lxxi. Hefte 5 u. 6.

[2] American Journal of the Medical Sciences, January, 1904.

Banti, however, showed that changes in the splenic and portal veins may be secondary to the disease of the spleen. The family character of splenic anæmia has been well shown by the cases of Brill,[1] and by the series of cases in one family reported by Springthorpe.[2]

3. *Splenomegaly Primitive.* While this cannot be distinguished clinically, the pathological differentiation is sharp. The essential characteristic is the presence of irregular oval spaces surrounded by fibrous tissue and filled to a greater or less extent with large endothelial cells. All writers agree that these alveoli are formed by proliferation of the endothelial lining of the splenic sinuses with fibrous hyperplasia of the surrounding tissue. Concerning the ultimate fate of the large cells opinions differ as to whether they may eventually become fibrous tissue or not. In my own case such transformation seemed impossible, and the condition was rather one of active neoplastic formation. Bovaird inclined to the belief that in his case there was only an endothelial hyperplasia. The distinction between the two is difficult, and a study of splenic anæmia shows that all gradations of endothelial proliferation have been present, from a slight degree up to the condition seen in my own case, which belonged to the group which Gaucher described as primary endothelioma.

Pathology. This has already been discussed in former numbers of PROGRESSIVE MEDICINE. Three sorts of changes have been distinguished: (1) congestion, (2) fibroid transformation, (3) endothelial proliferation. The first was conspicuous in only a few instances, and was most marked in doubtful cases. Fibrous hyperplasia is a marked condition in nearly all cases, as might be expected from the late stage of examination. Endothelial proliferation is not peculiar to cases of so-called splenic anæmia. A certain amount of such proliferation is found in cases of infective splenitis of all kinds, and this doubtless contributes in such cases, as in splenic anæmia, to the fibrous change in the reticulum. A very different condition is that first described by Weichselbaum as primary multiple endothelial sarcoma of the spleen, and later by Gaucher as "epithelioma primitif," and by Debove and Bruhl as "splenomegalie primitive." The conclusion I have come to in regard to cases of splenomegaly of this last type is that they represent a primary neoplasm of the spleen somewhat comparable to diffuse myelomata and to certain infiltrating sarcomata of the liver.

Treatment. Lichty's[3] statistics show that of 25 treated medically 5 are recorded as recovered; 12 as improved; 1 not improved; 7 died, hemorrhage being the most common cause of death. Of 8 cases operated upon, 5 recovered and 3 died. The very favorable results from *x*-ray treatment in leukæmia will probably cause an attempt to treat splenic

[1] PROGRESSIVE MEDICINE, 1902. [2] Loc. cit. [3] Loc. cit.

anæmia in this way. As yet sufficient time has not elapsed to enable records to be made as to the effect of such treatment. Cohen and Rosenberger[1] used the *x*-ray treatment in their case of splenomegaly, but it was combined with the use of arsenic and other drugs. Up to the present day arsenic seems to be the main reliance in the way of drugs.[2]

Leukanæmia. As one of the many combinations found in blood diseases may be mentioned leukanæmia, a name suggested by von Leube to describe a morbid condition in which the clinical symptoms characteristic of pernicious anæmia are combined with blood changes and anatomical changes characteristic of leukæmia or pseudoleukæmia, whether of the lymphocytic or mixed-cell type. Such a case is reported by Weber.[3] The patient was a German, aged fifty-eight years; admitted to the hospital December 10, 1903, suffering from anæmia, progressive weakness, anorexia, and tinnitus. He had been fairly well until the year previous, at which time he began to show weakness, loss of appetite, wax-like pallor. He had never had malaria, or been out of Europe, having lived in England since 1865. He had had a chancre in 1868, but no evidences of secondaries; there had been no hemorrhage of any kind.

Physical Examination. He was somewhat fat, and very pale, the color having a yellowish tinge; lungs were normal except for a few crepitations at the base; heart normal except for a soft systolic, apical murmur. The liver was greatly enlarged, extending from the sixth rib to the level of the umbilicus. The spleen was enormously enlarged, extending beyond the right of the median line, and to below the level of the anterior superior spine. There was no ascites. The lower extremities were somewhat œdematous. The urine was negative, the bowels regular, and there was no cough or vomit.

The patient failed steadily, and the œdema increased, becoming very noticeable in the face. He died January 15, 1904. The fever had been slight, being below 100°, and the pulse ranged between 76 and 96. Repeated examinations of the urine showed a trace of albumin on but two occasions. Blood on December 10, 1903: red cells, 1,800,000; white cells, 3000; hæmoglobin, 25 per cent. There was considerable poikilocytosis. January 7, 1904—differential count: small lymphocytes, 49.4 per cent.; large lymphocytes, 9.6 per cent.; polymorphonuclears, 37.5 per cent.; eosinophiles, 0.5 per cent.; myelocytes, 3 per cent. No eosinophile myelocytes were found. In counting 400 white cells, 30 nucleated red cells were seen, 24 normoblasts, 2 microblasts, and 4 megaloblasts. On January 14th a rough count estimated the red cells

[1] Loc. cit.

[2] For a consideration of the splenic anæmia of infants, see Blood Disorders in Early Life.

[3] British Medical Journal, June 18, 1904.

at 1,200,000; white cells at 12,000. During the last days of life the leukocytes appeared to have increased.

Autopsy, January 15th. The thorax and its contents showed nothing abnormal except some pleuritic adhesions, congestion of the left lung, and a moderate amount of serous fluid in the pericardium and both pleuræ. The peritoneum showed numerous small petechiæ. The spleen weighed 60 ounces (1872 grams). The capsule was a little thickened on section; the substance appeared normal except for a nodule about the size of a cherry, which proved to be an infarct.

The liver was uniformly enlarged, and weighed 88 ounces (2496 grams); it was apparently normal to the naked eye. The kidneys showed one or two patches of sclerosis, and were normal in size and weight.

The pancreas, suprarenal glands, stomach, and intestines showed no abnormality except a few small petechiæ in the gastric mucosa. The lymphatic glands generally were not obviously enlarged, but the prevertebral tissue about the bifurcation of the aorta was studded with small red hæmolymph nodes. The majority were small, about 3 or 4 mm. in diameter, but varying sizes were seen up to 20 mm.

All of the fatty marrow of the bone-shafts was found to have undergone transformation into a red substance of unusually firm consistence. Microscopic examination was made of the bone-marrow, liver, and spleen. In the former there was found an almost complete absence of the normal fat cells; there was found a stroma of loose connective tissue containing blood myelocytes, non-granular mononuclear cells, and numerous erythroblasts. In that portion of the marrow there had been, apparently, a conversion into a kind of loose connective tissue containing conspicuous groups of erythroblasts. The author regards this connective-tissue change in the bone-marrow as one of the most remarkable features of the case.

In certain portions of the liver the columns of liver cells were separated by groups of cells composed chiefly of myelocytes, large non-granular mononuclear cells, and erythroblasts, with an occasional coarsely granular eosinophile cell, and at times giant cells. These foreign cells occupied the space normally belonging to the intra-acinous capillaries. In places they seemed to be within the vessel, but usually were without.

In the spleen the Malpighian corpuscles appeared normal; the pulp was permeated with cells similar to those in the bone-marrow and the liver, excepting that there were no giant cells. At certain spots these cells were arranged in elongated clumps, some of which were evidently within the blood sinuses.

The kidneys and pancreas showed no particular change. The hæmolymph glands resembled normal lymph glands in structure, but con-

tained blood in the sinuses, and also the cells before described, and a few giant cells. Tests for the presence of free iron gave negative result in sections of spleen, liver and kidney.

The main features of the case may be summed up as follows:

1. Progressive waxy pallor and asthenia with maintenance of subcutaneous fat.

2. Changes in the red blood corpuscles similar to, but not so extreme as, those met with in true progressive anæmia.

3. Absence of true leukæmic changes in the blood, but presence of slight myelocythæmia and the inverted proportion of lymphocytes to polymorphonuclears as found in cases of lymphatic pseudoleukæmia (Hodgkin's disease, etc.).

4. No abnormal amount of pigment in the urine.

5. Changes found after death in the hæmopoietic tissues similar to those which occur in cases of "mixed-celled" leukæmia or pseudoleukæmia.

6. Abnormally firm consistence and increase of connective tissue in the bone-marrow from the shaft of a long bone.

7. Absence of enlargement of the ordinary lymph glands, but great hyperplasia of the spleen (hæmal gland) and prevertebral hæmolymph glands.

8. Absence of any reaction in sections of the spleen, liver, and kidneys for free iron such as is found in pernicious anæmia. Charcot-Leyden crystals were not noticed in the bone-marrow, etc., but were not specially looked for.

In spite of poikilocytosis, the disease in the present case seems not to have been secondary to any excessive hæmolysis, but to have been primary in the bone-marrow, and Weber would regard it as a myelogenic form of splenic anæmia of adults, doubtless allied to what French authors have termed "anæmie splenique myeloide." Therefore the case cannot be adduced as an example of pernicious anæmia being followed by, or becoming transformed into, leukæmia, though it is probable that similar cases have been erroneously supposed to illustrate such a course of events. It is also highly probable that similar cases, owing to enlargement of spleen and liver, have been clinically regarded (in spite of the poikilocytosis) as examples of Banti's disease. In the German cases enlargement of the hæmolymph glands was not noted.

"It is very tempting to suggest that in the present case both the spleen (hæmal gland) and the prevertebral hæmolymph glands were actively engaged in supplementing the erythrocyte forming functions of the diseased bone-marrow, but I have no conclusive evidence to support such a supposition. From what has been lately written on the subject, it seems that no really satisfactory evidence has been brought forward to

show that in adults erythrocytes are produced in the spleen and hæmolymph glands either in health or in disease."

Luce[1] reports a somewhat similar case. The red cells decreased progressively from 2,428,000 to 1,152,000, while the white cells varied between 37,600 and 81,600. The hæmoglobin varied between 45 per cent. and 20 per cent. The microscopic examination showed marked poikilocytosis and anisocytosis, and many microcytes and macrocytes, and some normoblasts and macroblasts, with polychromatophilia. The leukocytes showed increasing numbers of large mononuclears, the highest count being 49.5 per cent. Only one count of the myelocytes was given, and this gave but 0.5 per cent. The autopsy revealed leukæmic infiltration of various organs, lymphadenoid metaplasia of the bone-marrow, and large numbers of the "elements characteristic of pernicious anæmia," with an entire absence of siderosis. Luce believes that the pernicious anæmia in these cases is of myelogenous origin, and that the primary lymphadenoid or myeloid metaplasia of the bone-marrow gives rise to the pathological growth in the erythroblastic tissue. He does not think that "leukæmia" deserves a special place in the diseases of the blood-forming organs, as there is only a quantitative difference between these cases and those showing less marked anæmia. He offers the theory that cryptogenic pernicious anæmia, except when the condition is primarily or secondarily due to tumors of the bone-marrow, is the result of a leukæmic metaplasia of the bone-marrow.

Leukæmia. The literature of the past year has been unusually rich in contributions upon leukæmia and leukæmia-like diseases. The discussion particularly concerns the site of the disease, and the relationship existing between the different clinical varieties. There is a growing tendency to do away with the old nomenclature, which was founded upon the clinical aspect of the disease, and to adopt a new form of classification based upon the blood findings, it being assumed by the majority of observers that all forms of leukæmia are due to bone-marrow involvement. To add still further confusion to the already rather difficult subject is the attempt upon the part of some writers to show a relationship between the pseudoleukæmic conditions and true leukæmia, the former being considered but an early stage of the latter. Inasmuch as the chief feature of the malady is an increase in the white blood cells, the study of the origin and relation of the different varieties of leukocytes is of prime importance. The older idea was that the lymphocytes are derived from the lymph glands and possibly the spleen, and as the majority of leukæmias associated with increased lymphocytes in the blood showed involvement of these organs the relationship between

[1] Deut. Archiv f. klin. Med., Bd. lxxii. Hefte 3 u. 4.

the two seemed plain. With increase in knowledge and improvement in methods, cases of leukæmia without splenic or glandular involvement were reported in which the only pathological condition found was a change in the bone-marrow. This led to the belief that the bone-marrow was the organ at fault in all cases of leukæmia, the involvement of the spleen and lymph glands being secondary. This assumption was borne out by the cases in which, with marked glandular or splenic enlargement, no special change was found in the white blood cells. Studies of the bone-marrow conducted by Wolff, Michaelis, Pappenheim, Rubenstein and others (all previously discussed in PROGRESSIVE MEDICINE) led to the belief that in the bone-marrow there is a parent cell from which may be derived both lymphocytes and myelocytes through various stages of development. There are varying opinions as to the exact changes which take place in this process of ripening, but for the present these can be disregarded. From these investigations various graphic schemes of cell development have been devised, as well as plans of classification to show the relationship of one form to another, all of which has been considered in previous volumes of PROGRESSIVE MEDICINE.

LYMPHATIC LEUKÆMIA. The bulk of the investigations have been upon lymphatic leukæmia, and especially the acute variety. Türck[1] would include under the name of "lymphomatoses" all specific, true, hyperplastic tumor formation of lymphoid tissue due to formation disturbances. Under this heading he includes lymphatic leukæmia, acute leukæmia, pseudoleukæmia, lymphosarcoma, lymphosarcomatosis, chloroma, malignant lymphoma, and, perhaps, also splenic anæmia. He calls attention to the fact that the terms pseudoleukæmia, malignant lymphoma, and splenic anæmia are names used to designate clinical conditions which resemble each other outwardly but have no pathological relationship. A large portion of these do not belong in the territory of true hyperplastic lymphomatoses. Particularly is tuberculosis of the lymphatic apparatus included wrongly under these headings. Türck mentions besides ordinary scrofulosis two other forms of lymphatic tuberculosis in which there is a generalized lymphatic tuberculosis with splenic tumor. The fundamental basis of the true lymphomatoses is increased stimulation of growth in the lymphatic system. The cause is unknown. The difference in the manifestations depends upon two factors: (1) the degree of increase in growth and its local behavior, and (2) the presence or absence and the degree of washing out of cells, resulting from the growth, into the peripheral blood. As to the local behavior of the lymphatic tissue he gives these varieties: (*a*) Enlargement with limitation and maintenance of form. Gland capsules intact;

[1] Wien. klin. Woch., September 24, 1903.

adenoid growths in the mucous membrane are circumscribed. (*b*) Less tendency to generalization, but locally there is rapid spread to surrounding tissues. This form is malignant. Between this and the first variety all grades exist. (*c*) "Acute Growth." This shows a tendency to become general; does not tend to the formation of tumor masses; is related to the malignant type. Hemorrhagic diathesis and constitutional disturbance are marked. In a subgroup of this variety the lymphatic tissue of the mucous membranes, especially of the mouth, pharynx, and intestines, is infected. The hyperplastic lymphoid tissue allows easy access to bacteria. The lymphoid glands and spleen may be only slightly affected, or not at all.

The second characteristic of lymphomatoses is in the supply of cells to the peripheral blood. In one group all the new cells go to the formation of tumor masses, and the blood picture is unchanged. The blood finding is *alymphemic*. In a second and larger group, besides the cells making up the tumor masses, there is an increased washing out into the blood of the cells representing the product of increased growth—the lymphocytes. Depending upon the number of these cells, Türck recognizes a sublymphæmic and a lymphæmic condition. The difference is purely gradual. Türck does not deny that the bone-marrow may be involved, and even admits the possibility of this being occasionally the sole site of the disease, but he does deny the absolute dependence of the lymphæmia upon the bone-marrow changes in all cases. Kelly[1] in reporting four cases of acute lymphatic leukæmia takes the view that the bone-marrow is always at fault in all leukæmias, and suggests that we designate the leukæmia as lymphocytic or myelocytic according as the blood shows a prominence of either type of cell. Pappenheim[2] insists that there are two chief forms of leukæmia: one in which only non-granular, mononuclear cells develop in the bone-marrow, and another in which, besides these cells, there is an increase in, and increased new formation of, granular cells—myelocytes and leukocytes. The first he calls lymphoidal leukæmia and the second mixed-cell myelocyte leukæmia. According to Pappenheim there is always increased formation of the lymphoid cells along with the myelocytes, and he therefore objects to the term myelocytic leukæmia. Hamman[3] in reporting 4 cases of acute leukæmia has reviewed the literature on the subject, and has collected 124 cases besides his own up to July 1, 1903. After reviewing the list of cases he found 111 that could be considered as certain. These he divided into groups: (1) cases giving the blood formula of Fraenkel, 57; (2) cases in which the small lymphoid (the typical lym-

[1] University of Pennsylvania Medical Bulletin, October, 1903.
[2] Zeit f. klin. Med., Bd. lii. Hefte 3 u. 4.
[3] American Medicine, January 23, 1904.

phocyte) cell predominated, 12; (3) cases impossible to classify because of insufficient blood examination, 35; (4) cases with irregular blood picture, 7. From a study of these, Hamman concludes that we have three types of leukæmia: myelocytic, lymphocytic, and the type showing the blood picture of Fraenkel. He thinks it is not justifiable to include the latter group as a subvariety under lymphatic leukæmia. The presence of typical blood pictures of the first two is an almost, but not quite, absolute indication of chronicity, while in those of the type of Fraenkel the acuteness is the chief clinical characteristic. Between the blood pictures and the clinical course of the disease there are all grades of transition. Rosenberger[1] reports a case of acute leukæmia in which the predominant cell was the small lymphocyte, and the duration was only about three months. Similarly, Leclerc[2] describes a case of acute leukæmia in which the large majority of the lymphocytes were of the small variety; and in the case of Winter and Gwyn,[3] the small and intermediate lymphocytes formed 98 per cent. of the total. Weber,[4] however, reports a case in which, while 92 per cent. of the leukocytes were lymphocytic, 56.3 per cent. were large and 36.4 per cent. were small. On the other hand, all of Kelly's[5] cases showed predominance of the large lymphocytes, as did the case reported by Miller and Hess.[6] This case was peculiar in that the patient died from rupture of the spleen.

It is thus seen that in the cases of acute leukæmia we have to do with all grades of proportional increase, and that this increase may affect chiefly the lymphocytes (the usual variety), but also the myelocytes, as reported by Billings and Capps in last year's review.

Regarding the diagnosis of acute leukæmia it must be borne in mind that many of the cases are atypical, and that no splenic or glandular enlargement may be present. Kelly[7] mentions the resemblance to sepsis and scorbutus, and calls particular attention to the resemblance to *typhoid fever* of cases in which the glandular enlargement is slight, and the splenic tumor not marked. He believes that some cases have been so confounded. While the diagnosis can be made from the blood examination a single enumeration is not always sufficient. Thus, in one of Kelly's cases the leukocytes in one examination were as low as 5200, yet the differential count showed over 90 per cent. of lymphocytes.

Acute Leukæmia in Children. The occurrence of acute leukæmia in children has not been so frequently reported as in adults, but this is probably due to a failure in making the necessary examinations. In

[1] American Journal of the Medical Sciences, October, 1904.
[2] Lyon Médicale, February 14, 1904.
[3] University of Pennsylvania Medical Bulletin, April, 1904.
[4] Transactions of the Pathological Society, London, vol. liv.
[5] Loc. cit.
[6] American Medicine, March 5, 1904.
[7] Loc. cit.

1900 McCrae described a case and was able to collect 13 others. Hutchinson[1] gives notes on 2 cases and has collected 12 more, besides those of McCrae. Churchill[2] publishes one case and reports 14 others not given by McCrae. It is very probable that Hutchinson and Churchill report on some, at least, of the same cases. Finally, Savory[3] reports a case in a boy of four and one-half years, who died in less than two months from the date of onset. The age of the children reported varies from eight months up to ten years. The symptoms and clinical course of the disease are much the same as in the adult, always terminating fatally. Hutchinson, following the plan adopted by Guinon and Joly, describes three types of cases: first, those showing profound anæmia with general glandular enlargement, and exhibiting a hemorrhagic tendency in the later stages of the disease; second, those in which the hemorrhagic character is manifest from the outset, petechia appearing early, so that the case may resemble one of infective purpura; and third, pseudoscorbutic cases, in which lesions of the buccal cavity are the most striking feature.

CHRONIC MYELOGENOUS LEUKÆMIA. Comparatively little attention has been given to this variety of leukæmia, due, perhaps, to the fact that it is relatively frequent in the adult, and also that there is unanimity of opinion as to its pathogenesis, if we except Löwit, who stands alone. It is of interest, however, to note the great infrequency with which this variety occurs in children. Hutchinson[4] calls attention to this fact, and could find in the literature but four cases, to which he adds one of his own. This was in a girl of four years and eleven months. She showed no excessive pallor, and the liver and lymphatic glands were not palpable. The spleen was enormously enlarged. The blood showed 2,425,000 red cells; 25 per cent. of hæmoglobin; 1,590,000 leukocytes. Of the latter 56.1 per cent. were neutrophile myelocytes; 3.9 per cent. basophile myelocytes; 9 per cent. eosinophile myelocytes; 30 per cent. polynuclears; 0.7 per cent. lymphocytes. In only one recorded case did the condition appear during the age of infancy. This was a case reported by Monti and Berggrün in a child of one year. It had congenital syphilis and rickets, and showed very marked splenic enlargement, and some increase in the size of the lymphatic glands. The red cells numbered 1,846,000, and the white cells 66,422. Of these the great majority were large nuclear forms with fine neutrophile granules. The eosinophiles were increased, but the polynuclears and the lymphocytes were diminished. This infrequency, according to Hutchinson, might suggest that the cause of myelogenous leukæmia was not operative at this time of life.

[1] Lancet, May 19, 1904.
[2] American Journal of the Medical Sciences, October, 1904.
[3] Lancet, February 6, 1904.
[4] Loc. cit.

Influence of Complicating Diseases upon Leukæmia. It has long been noted that intercurrent affections in cases of laukæmia at times produced very distinct changes in the original ailment, and especially in the blood picture. Observations upon this topic have been published from time to time in this journal. Recently Dock[1] has reviewed the entire subject, and from his investigations has brought to light some interesting facts. One of his own cases is of special interest because of the thoroughness with which the blood was studied before, during, and after the infection. The patient was a woman of forty-two years, whose present illness began about two years before coming under observation. She was first examined December 29, 1896, when she presented all the physical signs of myelogenous leukæmia, the liver and the spleen being enormously enlarged. The blood count at this time showed: red corpuscles, 2,500,000; white cells, 367,000; hæmoglobin, 50 (Fleischl). The differential count of the leukocytes gave: lymphocytes, 0.3; mononuclear neutrophiles, 48.8; polynuclear neutrophiles, 41.6; polynuclear eosinophiles, 0.7; mononuclear eosinophiles, 1.4; basophiles, 2; degenerated, 5. The diagnosis of myelogenous mixed-cell leukæmia was made and she was given arsenic. On February 1, 1897, she was again seen, complaining of great weakness, dyspnœa, pain in the left side, and general itching. She gave a history of having had influenza two weeks before, with tonsillitis and coryza. At this time physical examination showed moderate redness of the pharynx, a few rales in both bases, and soft systolic murmur over the base of the heart. The spleen was markedly smaller in size than it had been previously, was tender on pressure, freely movable, and over it could be felt a distinct fremitus. The blood count showed only 7500 white cells, the red cells and the hæmoglobin being practically as before. She had been taking arsenic up to 12 drops t. i. d., and this was continued along with 4 c.c. of bone-marrow t. i. d. A differential count made on the following day showed the 8125 leukocytes to be composed of small lymphocytes, 4.2; large lymphocytes, 5.7; transitional and large mononuclear cells, 4.9; polynuclear neutrophiles, 70.6; myelocytes, 12.3; degenerated, 6. There were no eosinophiles or basophiles found. On February 12th the leukocytes numbered only 5000. On March 12th they numbered 35,156, and the spleen and liver showed practically no enlargement. The leukocytes increased in number until on June 4th they numbered 307,000, but the spleen and liver remained of normal size. At this time she was seized with chills, which were repeated several times, and for the next three weeks had considerable fever and severe pain in the region of the spleen, which required morphine. On July 1st the spleen and liver were again noted as being enlarged. Subsequently

[1] American Journal of the Medical Sciences, April, 1904.

both became smaller. The liver returned to its normal size, but the spleen, with periods of reduction in size, became larger and larger, until the patient died about June, 1898. The last year of life showed fluctuation in the leukocyte count down to 57,000, but toward the end the count was high, reaching beyond 200,000.

Cases of Tuberculosis and Leukæmia. In discussing this combination, Dock mentions the fact that the occurrence of the two diseases in the same patient was noted as early as 1849 by Virchow, and that tuberculosis occurred in 12 out of 100 cases of leukæmia analyzed by Martin Ehrlich in 1872. In more recent literature the combination is less frequently reported, but Dock is of the opinion that the infrequency is not so great as has been generally held. There is some difficulty in establishing a diagnosis because the cases of leukæmia stay so short a time in the hospitals, and the clinical symptoms of the tuberculous infection may not be well marked. Thus, in Dock's own cases, 25 in number, clinical evidences of tuberculosis were not found in any, but in 2 out of 6 autopsies miliary tuberculosis was found. He is inclined to the opinion that more extensive observations will show that the combination may occur fairly often. A point to be borne in mind is that small leukæmic growths may resemble tubercles, and on that account the studies prior to 1882 are unsatisfactory.

From the literature Dock has collected 27 cases, to which he adds 2 of his own, making 29 in all. From a study of these he concludes that chronic tuberculosis does not materially alter the course of leukæmia, nor does it influence the leukocyte formula. Acute miliary tuberculosis, on the other hand, is followed by, or associated with, a reduction in the leukocytes in the majority of cases. The exceptional cases may be due to the slight development of the miliary tuberculosis in extent, or to the fact that death occurs before there is time for the change to take place; or, finally, as has been suggested by De Roth, the body becomes accustomed to the infection, and the leukocytes are not affected as in more acute cases. One of Dock's cases was a woman, aged twenty-five years, who was first seen June 2, 1896. She had been ill for a year, the abdomen being enlarged for nearly that length of time. She showed a mixed-celled leukæmia with 598,000 leukocytes. There were large ecchymoses about the anus and on the legs. The spleen was greatly enlarged. The liver was not enlarged; the axillary and cervical lymph glands were increased in size, but no enlargement was found in the inguinal glands. The ecchymoses disappeared in three weeks, and she improved somewhat. She was under observation for two years but the leukocyte count was unchanged. She passed from observation, and came to autopsy a year later. The spleen was enlarged, but the chief picture was that of a severe tuberculosis of the serous membranes. The blood showed no

increase in leukocytes, and microscopic examination of the tissues revealed a complete absence of leukæmic changes except in the bone-marrow, which was lymphoid. In a second case, a man aged twenty-nine years, who died with so-called leukæmic apoplexy, there was no decrease in the number of leukocytes up to the time of death. At autopsy a recent slight miliary tuberculosis was found.

Miscellaneous Infections. Including his own case, Dock was able to find reports of 23 cases of leukæmia in which an intercurrent infection other than tuberculosis had occurred.

In medullary or splenomedullary leukæmia the infections reported were typhoid-like disease; afebrile typhoid; erysipelas; erysipelas, streptococcus and diplococcus infection with miliary tuberculosis; sepsis; empyema; influenza; peritonitis. In lymphatic leukæmia, generally the acute form, there are reported: sepsis, angina; angina (streptococcus); streptococcus infection, sepsis (staphylococcus); colon bacillus; staphylococcus and colon; pneumonia. Chronic lymphocythæmia has been observed, complicated by pneumonia and by bronchitis.

The behavior of the leukocytes in these cases was as follows: there was marked decrease near or to the normal number in 11; a relatively slight fall occurred in 9; in 3 there was no change, or even a rise was noted. Comparisons between the cases are difficult as they differ so much in detail, and in many of them more than one infection was present. It is of interest to note that in three cases in which during infection there was a rise in the leukocytes, death occurred soon after. It is possible that there might have been a fall if the cases had ended less abruptly.

The earliest period after the complication has rarely been carefully observed, and should be thoroughly studied in the future. From a full consideration of the reported cases it is apparent that in the majority of instances intercurrent infection causes a decrease of the leukocytes in leukæmias of various kinds. The fall may be so slight as to leave the gross picture of leukæmia unchanged, but in about half the cases the white corpuscles fall to normal or below. It is interesting to note the extreme leukopenia that occurred in some cases; thus, in two instances a fall of 600 was noted, and in one case reported by Cabot the white cells were reduced to 471. Besides the leukocyte decrease, the enlarged organs became smaller; sometimes the diminution in size was earlier, sometimes later, and sometimes coincident with the diminution in leukocytes, and sometimes the organs became smaller without any change in the white cells. The diminution may be very rapid. It is often difficult to distinguish between this change in the organs and that observed in some cases of leukæmia a short time before death.

Concerning the qualitative change in the leukocytes it is difficult to draw conclusions, as in the reported cases the variations have not been uniform.

There is a tendency to the disappearance, more or less completely, of the leukæmic character of the blood under the influence of infections, and to the increase of the polynuclears, absolutely as well as relatively.

Changes in the Red Blood Corpuscles. These changes have not been thoroughly studied in complicated leukæmias. Out of 18 cases, of which full reports are given, there was a rise in the number of red cells in eight instances, simultaneously with the fall of the leukocytes. The difference was often slight, but in six it was over 500,000. It should be borne in mind that great variations in the red cell count occur in uncomplicated leukæmias. It is of interest to note that four cases in which a marked increase in the red cells occurred were cases complicated by tuberculosis.

The period at which a change in the blood picture occurs after the onset of infection cannot be definitely determined, because of the few cases in which the process could be observed from the beginning. In general it may be said that the fall occurs soon after the infection, more promptly in acute than in chronic infections. The cases of chronic infections, however, are too few and too diverse in character to permit of sweeping conclusions.

The Effect of Various Processes Other than Infections on Leukæmia. Most of these observations have been carried on with a view to determining the therapeutical effect of certain remedial agents. A large number were experiments with arsenic, and certain cases under the effect of this drug showed a marked and rapid diminution in the leukocytes. Thus, in one of Thayer's cases the leukocytes fell from 714,000 to 7500 in twenty-three days. The leukocyte formula was changed, showing a relative increase of lymphocytes and polymorphonuclears, and a diminution in the myelocytes, though these were still present. Somewhat similar cases have been reported by Bramwell, Cabot, and others. McCrae reports a case in which the white cells fell from 584,000 to 5000 under the influence of arsenic, and myelocytes entirely disappeared. A case similar to this is reported by Taylor. Other drugs have been found to have somewhat the same effect, such as thyroiodin, quinine, and tuberculin. In a case in which cinnamic acid was used there was an increase of leukocytes from 170,000 to 560,000. A decrease was obtained by the use of splenic extract. Similarly, a marked decrease has been reported as the result of massage of the spleen. Various theories have been advanced to explain the condition.

THE TREATMENT OF LEUKÆMIA BY THE *X*-RAYS. Within the past year a large number of articles have been published detailing the effects produced upon leukæmia by the Roentgen rays. The entire literature upon the subject has been covered by Dock.[1] Senn was the first to draw

[1] American Medicine, December 24, 1904.

attention to this form of treatment in August, 1903. From our knowledge of the effect of the *x*-rays upon certain morbid growths, as carcinoma, it would seem that the thought suggesting the use of the rays in leukæmia would have been a desire to get rid of the tumor-like growths characteristic of the disease; Senn, however, used the *x*-rays to destroy certain organisms which he thought stood in relationship to leukæmia. Dock was able to collect, and has studied the reports of, 29 cases, but he states that there have probably been many more which, up to the present time, have not been fully described. Of the reported cases, 2 were of the acute lymphatic type, both of which resulted in death. Capps and Smith have thought that acute cases were not proper subjects for the *x*-ray treatment. Five cases of chronic lymphatic leukæmia have been reported as having undergone this treatment, and of these 1 died after sixteen months, 1 after eight months; 1 improved; 1 has been under treatment for five months with marked reduction in the size of the spleen and glands, and a diminution of the leukocytes from 150,000 to 4200; while in the last case, after eight months' treatment, the spleen and glands are practically normal and the leukocytes show a reduction from 295,000 to 6800.

There are 21 reports of the mixed-cell, myelogenous, or splenomedullary cases. Some of these cannot be used in the way of analysis. Of the 21 cases, 11 showed a reduction of the leukocytes under treatment to almost the normal number. In 7 others there was a marked reduction, but the leukocytes still remained high enough to suggest leukæmia. It is an important fact that in only two-thirds of the cases was there such a fall in the number of leukocytes as to justify a claim to marked improvement, so far as the number of the leukocytes can be used for that purpose.

Technique of Treatment. This has varied considerably in the different cases. Some of the patients have been treated only over the spleen; others over the spleen and epiphyses of the long bones, or the long bones themselves, and the sternum. In none of them was the treatment applied only to the bones. Dock himself is trying this method with unsatisfactory results. Oliver saw less effect from treatment of the bones than from that of the spleen. Good results have followed from treating the spleen alone. Others, as Evans and Dunn, did not have as good results from treatment of the spleen alone, but quite as good as several who treated the bones as well as the spleen.

Regarding the length of time of the single exposure, there has not been very great difference in the cases. This factor must be determined by subjective or objective reactions in the skin. Exposures of ten to twenty minutes have been the most frequent, and these have been repeated every day, every other day, or even less frequently. It is impossible to

estimate the dosage of the Roentgen rays because of the lack of special details in many cases, and the contradictory results. The points that should be considered, in reference to the dosage, are the degree of vacuum of the tube used, the distance of the anticathode from the part exposed, the time and frequency of exposure, and the value of the exciting current. Future investigations will have to determine the best plan to follow. Among the cases, tubes of low, medium, and high vacuum were used, and in all of these good results were obtained. Theoretically, a hard or high vacuum should be better in the treatment of internal organs, because the rays are supposed to traverse the superficial tissues and affect the deeper ones. With hard tubes also there is less danger of burns.

Qualitative changes in the white cells have not been as thoroughly studied as could be desired. In 5 of the reported cases the leukocytes are described as normal, or it is specifically stated that myelocytes were absent in the stage of apparent recovery. In other cases, despite the improvement, myelocytes were still present in the blood in considerable numbers. Still less attention has been given to the changes in the red blood cells. Out of 12 of the myelogenous cases, a gain was noted in all but one. The hæmoglobin usually increased with the red cells.

The effects on the glands and spleen are often striking. In all of the chronic cases the glands diminished. The change in the spleen was not uniform in all cases. Among patients with a normal number of leukocytes the spleen diminished markedly in 8, and moderately in 3; in the others, the spleen was much reduced in 1, moderately in 4, little or none in 2. It must be remembered that in certain cases marked connective-tissue overgrowth may prevent the organ from resuming its original size.

The effects resulting from *x*-ray treatment are difficult to describe in exact terms. In most cases there was marked improvement in the subjective sensations, while œdema often quickly disappeared. The general improvement was sometimes marked when the blood and spleen were but little altered; thus, in the case of Cheney,[1] a patient who had been under observation six months without improvement, and who showed marked symptoms of pallor, weakness, shortness of breath, and abdominal distention, improved very rapidly under the *x*-ray treatment. At the end of two weeks he felt much better, did not tire so easily, could walk farther, and could eat without abdominal distress. By the end of two months he felt perfectly well, had lost his pallor, looked well, and had gained ten pounds in weight. It is interesting to note that in this case the spleen was not materially changed in contour. The leukocytes varied between 70,000 and 90,000, and the myelocytes,

[1] Medical News, November 5, 1904.

at their lowest, were 27 per cent. The red cells increased from 2,508,000 to 4,750,000 and the hæmoglobin from 47 per cent. to 75 per cent.

Deaths and Toxic Effects. Of the 18 myelogenous cases 5 died, some of the deaths having occurred among patients apparently most improved. Toxic symptoms have been noted in several; in most of these the toxic symptoms developed subsequent to dermatitis, though it is difficult to connect the two in a causal relationship.

Conclusions. Under treatment with Roentgen rays some cases of leukæmia undergo marked change for the better. The leukocytes fall to normal numbers and sometimes show no more pathological cells, the red blood corpuscles improve, the enlarged spleen and lymphatic glands resume normal proportions, and the general health seems restored. In some cases the effects are imperfect.

In no case has observation been carried out long enough to speak of cure. In several cases death has occurred while the symptoms seemed to indicate improvement. The mode of action of the Roentgen rays is not known. It probably consists in affecting the tissues that produce the pathological leukocytes, either directly or more probably through the production or setting free of substances that affect cell formation, or degeneration, or chemotaxis, or all of these processes; but further investigation is necessary. At present the improvement must be considered functional and not affecting the original cause, nor in a permanent way the morbid histology of the disease. The improvement of the red blood cells may be due to general stimulation of nutrition, in which suggestion may have a part, or by diminution of lymphoid or myeloid tissue, and thus permitting development of red cells, as suggested by Ahrens.

Though the change seems a functional one it is possible that treatment in very early stages may be more effective than it has hitherto been.

Roentgen ray treatment of leukæmia is dangerous on account of the usual risk of dermatitis and burns, but probably also on account of toxic processes as yet impossible to explain. No stronger claims can be made for it than can be made for arsenic and certain serums and bacterial toxic substances, but it may prove more certain in its action than arsenic and can be more readily applied in practice than the injection methods. Careful observation and recording of all cases in which the treatment was followed promise advances in our knowledge of leukæmia, with the possibility of gains in practical therapeutics.

No special rules can be laid down at present for the treatment with Roentgen rays. Great care should be taken to avoid burns. Methods should be as fully described as possible in each case; the blood should be carefully examined as fully and as frequently as possible, and, if possible, urine examinations should be made, to throw additional light upon the metabolic changes.

Chloroma and Leukæmia. The occurrence of this malady is rare, but within the last few years a sufficient number of cases have been collected to justify its being looked upon as a clinical entity, and to permit of a fair description. This is of importance because of the fact that in only a few instances has the disease been diagnosed ante-mortem. George Dock and Aldred Scott Warthin[1] report a new case, and give the cases reported since 1893, at which time all the instances then recorded were published by Dock. In the first paper there were records of 17 cases, and in the present article 22, including their own case, making 39 in all. Several other cases have been spoken of, but not formally reported. The statistics from these cases are of interest in showing the characteristics of the disease.

The average age of onset is below twenty years, the earliest being at ten months and the oldest at fifty-two years. The average duration was five and a half months, the shortest duration being one month and the longest eighteen months. Nine cases occurred in females and 29 in males. The peculiar green, tumor-like growths show special predilection for the skull, which was affected in all but two cases. Other sites are the sternum, vertebra, bone-marrow, liver, kidneys, and spleen. Usually the lymph glands are involved, as may be almost any organ or tissue. In the bones the tumor formation is most common in connection with the periosteum. At times the skin may also be involved. The chief clinical features as summed up by Dock in his former publication were: "The appearance, usually before the age of twenty, of anæmia without evident cause, with loss of strength, dyspnœa, and emaciation, hemorrhages in the skin, the mucous membranes (epistaxis), or internal organs (retina); rapid pulse; ocular symptoms, such as difficulty of vision, strabismus, and especially exophthalmos, without the special features of Basedow's disease, and with tumor in the orbit; deafness and ringing in the ears, and tumors in the temporal regions, or in the cranium, or in other parts of the body." In the clinical histories of eighteen patients in the last series, early weakness was noted in nine, pallor or anæmia in eleven, exophthalmos in eleven, swelling and eversion of the lids in another, deafness in ten, swelling of the temporal region in nine, swelling of the face in three more, enlarged lymph glands in eight; emaciation in six, rapid pulse in six. Pain was often a prominent symptom, and was most often felt in the head, eyes, teeth, or ears, or in the hips or legs. Hemorrhages in the skin or mucous membranes were noted in 8 cases. Blindness occurred four times. The liver was enlarged in 3, the spleen in 7 cases. *Albumose* (Bence-Jones) was present in Weinberger's case. In both of Rosenblath's it was absent.

[1] Medical News, November 19 and 26 and December 3 and 10, 1904.

In other cases there are no evidences for or against. It is noteworthy that in the 3 cases cited the bone marrow was altered.

Concerning the blood finding special attention is given to the behavior of the leukocytes, because of the resemblance which chloroma bears to leukæmia. The red cells are reduced in number (to 509,600 in Dock and Warthin's case), and the hæmoglobin percentage low (15 per cent. in the same case). There may be occasional normoblasts or megaloblasts, and basophilia may be present. The changes in the red cells are not marked. They take the usual stains well, and in general show little that is characteristic. The leukocytic changes have been of a varying kind. Most often there was found a leukocytosis, varying in amount up to 491,600, but usually below 50,000. The most important change consisted in a relative and absolute increase in the lymphocytes, often with the appearance of a lymphocyte-like cell resembling those found in the bone-marrow. This increase in lymphocytic cells may occur even when the total number of leukocytes remain within normal limits, as in a case of Bramwell's. The behavior of the colorless corpuscles has led to the confounding of chloroma with leukæmia, especially acute leukæmia, and Dock and Warthin are inclined to the view that there is a definite relationship between the two diseases. Unfortunately, the course of the blood changes from onset to termination has not been studied as yet, so our knowledge of the hæmatology of the disease is too incomplete to justify very definite statements. The tendency, however, is to look upon all diseases accompanied by lymphoid hyperplasia as being more or less akin. The conclusions of Dock and Warthin seem to be justified.

1. *Chloroma is a tumor-like hyperplasia of the parent-cells of the leukocytes, primary in the red marrow, the periosteum being involved only secondarily.* The possibility of a primary chloroma, in any part of the body in which white cells are formed, must be considered.

2. As a result of this leukoblastic hyperplasia, atypical leukocytes or leukocytes corresponding to some one of the normal types, may appear in the circulating blood in varying number. Chloroma is, therefore, to be classed with the leukæmias.

3. The white cells resulting from the atypical proliferation may in different cases attain different stages of differentiation. In some cases they may be of the large lymphocyte type, in others of the type of neutrophile or eosinophile myelocytes. At different stages of differentiation atypical forms may be produced. Whether a small lymphocyte type exists remains to be more definitely shown.

4. It is evident, therefore, as in the case of other leukæmias, that the blood picture in chloroma may be very varied, and if this be used for a basis of classification it is possible to designate different varieties of chloroma.

5. It is also possible that in certain cases, or possibly stages, of chloroma the hyperplasia of the parent cells may reach such a stage that the new forms do not get into the blood stream in such numbers as to give the picture of a leukæmia. An aleukæmic chloroma is, therefore, possible.

6. The essential difference between chloroma and other forms of leukæmia is the more marked neoplastic character of the former, and the formation of the green infiltrations and metastases. The following classification of chloroma is, therefore, proposed:

- Chloroma (chloromatous leukæmia).
  - 1. Aleukæmic chloroma (?).
    - 1 Small lymphocyte type (?).
    - 2. Large lymphocyte type.
    - 3. Neutrophile type.
    - 4. Eosinophile type.
    - 5. Atypical.
    - 6. Mixed.
  - 2. Leukæmic chloroma.

7. Chloroma is probably to be regarded as a more malignant form of leukæmia. The white cells resulting from the atypical proliferation have the power of multiplying in the blood streams and in the tissue spaces, thus giving rise to masses of cells having the characteristics of metastatic tumors. It is probable that the proliferative activity is proportionate to the lack of differentiation. In the neutrophile and eosinophile forms we should expect a less marked tendency to proliferation; on the other hand, the large lymphocyte and atypical forms would show a greater proliferative capacity, and hence be more malignant. The aleukæmic types theoretically would be the most malignant of all, and present characteristics more closely allying them with the sarcomata.

8. The atypical hyperplasia of certain of the elements of the bone-marrow leads to the crowding out and replacement of the erythroblastic elements, and a consequent lessening of red-cell formation. Chloroma is, therefore, attended by, and is the cause of, a severe *anæmia*, to which the chief symptoms of the disease are probably due. This anæmia, while it may resemble pernicious anæmia in many ways, is essentially *an anæmia of deficient hæmatopoiesis and not of excessive hæmolysis.*

9. The malignancy of chloroma depends, therefore, chiefly upon the replacement of the red marrow and the consequent diminished red cell formation. The slight antagonism between the new cells and the body cells would otherwise place it among the relatively benign growths, except in those cases in which important nerve structures are injured by compression by the infiltrations, or through rarefaction of the bones. The large numbers of degenerating white cells present throughout the body may possibly give rise to an intoxication.

10. The cause of the green color remains unknown. It is probably a parenchymatous color. It is possible that processes morphologically

like chloroma may lack the characteristic green color. Such cases should be classed with the non-chloromatous leukæmias.

11. While classing chloroma temporarily as a unique form of neoplasm the question of the ultimate etiology of the process is not settled. At present intoxication or infection can no more be ruled out than in the case of carcinoma or sarcoma. We are in the same position here as in the case of neoplasms in general.

Disorders of the Blood in Early Life. Hutchinson, in his Goulstonian Lecture,[1] takes up in detail the consideration of the physiology and pathology of the blood and the blood-forming organs in early life. The blood picture of infants differs normally from that of adults, as is well known. At birth the red cells number 6,000,000, reaching 5,000,000 by the end of the second week. The hæmoglobin at birth is 110 per cent., and falls gradually in proportion to the diminution in red cells, reaching the normal, 100 per cent., at the end of the second week. After the second week the course of the red cells and the hæmoglobin is no longer parallel; the hæmoglobin falls gradually, reaching its minimum of 70 per cent. at the sixth month, and stays at this level until about the beginning of the second year, when it slowly rises, reaching the adult standard at the sixth year or later. The blood is, therefore, comparatively chlorotic in type, and this fact is of importance in the study of blood disorders, on account of the readiness with which this physiological condition becomes exaggerated. The author lays little stress on the histology of the red cells, the tendency to inequality in size he thinks explainable on the ground that they are very rapidly produced, and that these inequalities are probably of little importance. He thinks that the red cells of the child are probably more vulnerable than those of the adult. He also calls attention to the wider extent of the red marrow in childhood. This is of importance as pointing to the fact that the whole of the marrow of the long bones in childhood is already occupied in the manufacture of red cells, and there is, consequently, no reserve power formation as in the adult. This may account for the fact that children stand hemorrhage badly, and tend to become anæmic on slight provocation.

The Leukocytes. It is of importance in examining the white cells to note not only the percentage proportions, but the total number as well, because the high percentage of any one kind of cell, due to an absolute count of its numbers, may make the other cells appear relatively diminished, while in reality their absolute number may be unaffected. In the newborn infant the total number is 20,000; this is shown to be due to the high absolute number of polymorphonuclear cells. At the end of

[1] Lancet, May 7, 14, 21, 1904.

the first week this number falls to about 10,000. A second rise now occurs which persists until the sixth month, this being due to increasing mononuclear cells, chiefly lymphocytes. After the sixth month the total number of lymphocytes slowly declines, and with it the total number of leukocytes, until about the sixth year, when the adult proportion is reached. In other words, we have during the first week a polymorphonuclear leukocytosis which rapidly diminishes, so that by the end of the first week the polynuclear cells number about 5000, which number they maintain throughout life. The mononuclear cells show a gradual rise from the beginning of the second week, reaching its culmination at the sixth month. They then fall, and at the end of the third year about equal the number of the polynuclear leukocytes, but do not reach the stationary—about 2000 per c.c.—until the sixth year, which number persists.

The significance of the initial leukocytosis is not understood. The fœtus in the last months preceding birth has a fewer number of cells than the mother. The increase in the polynuclear cells is a phenomenon connected with birth.

"If I may gather these preliminary observations on the process of blood formation and its results in infancy to a focus I would say: 1. That the red marrow at this period of life is engaged almost to the limit of its functional capacity in the production of red cells—cells, however, which are individually less richly charged with hæmoglobin than those of the adult. 2. That the production of granular forms of white cells goes on as in the adult in the marrow and apparently at almost the same rate of activity. 3. That the non-granular cells, on the other hand, are present in the blood of the infant in markedly larger absolute numbers than in the adult, and, corresponding to this, the adenoid tissue which is concerned in the production of these cells is extremely abundant, active, and widely diffused. 4. That although this specialization of function on the part of the two great blood-forming organs—the marrow and the adenoid tissue—has taken place in the child as in the adult, yet the former—standing nearer the period of fetal life—may be expected to be able, under the stress of disease, to revert more easily to the fetal methods of blood formation and to exhibit in pathological conditions a less sharp degree of specialization on the part of the marrow and adenoid tissue respectively. It is the combination of a high absolute number of non-granular cells with a relatively low percentage of hæmoglobin which constitutes the hall-mark of the infantile type of blood; and in all conditions of profound anæmia in childhood these characters tend to assert themselves with even greater prominence."

The disorders of the blood he speaks of under the following groups: 1. Congenital abnormalities of the blood. 2. Primary anæmias. 3.

Secondary anæmias. 4. Blood disorders associated with enlargement of the spleen. 5. Leukæmias. 6. Affection of the adenoid tissue.

Under the congenital malformation of the blood he instances cases of (*a*) *infantilism*. One, a girl aged seventeen years, showed polynuclears, 29 per cent.; eosinophiles, 12 per cent.; non-granular cells, 59 per cent. Second, a boy of nine years, also physically and mentally backward, showed polynuclears, 54.8 per cent.; eosinophiles, 3.6 per cent.; non-granular cells, 41.6 per cent. Total leukocytes, 8900. Third case, a girl of nine and a half years, presented the physical characteristics of a child of five years, but there were no signs of cretinism. The mononuclear cells were 60.4 per cent.; polynuclear, 39.6 per cent. Perhaps the tendency to a lymphoid status in these cases may explain the blood picture.

In most cases of cretinism but little that is abnormal has been found. No blood records from cases of mongolism have been reported.

(*b*) *Congenital Anæmias*. Under this head he mentioned four children, all of whom had been very pale from birth. All of them showed more or less signs of rickets, and all showed marked diminution in the number of red cells. There was no distinct leukocytosis, and the differential blood count showed the infantile excess of mononuclear cells. The cases of aplasia of the bone-marrow reported by Ehrlich, Epstein, and others are interesting in this connection.

(*c*) *Primary Anæmias*. He reports two examples of this in which there was marked diminution of the hæmoglobin, both of which improved markedly under treatment with iron. Both of the children showed evidences of rickets. Hutchinson does not believe that the anæmia is secondary to the rickets, but rather that the rickets and the anæmia are both results of insufficient food. The important factor is the small amount of iron. Human milk is very poor in iron, and bad health in the mother may lower this still farther.

Pernicious Anæmia. This must be very rare; from the literature the author was able to collect only 11 cases, only 5 of which he thinks are genuine. "The rarity of pernicious anæmia in childhood is a surprising fact. Recollecting the vulnerability of the blood at this time of life, and the ease with which injurious influences seem to affect it, one would have expected, if pernicious anæmia be really due to the excessive destruction of the blood by a poison, as most authorities seem to think, that it is at this time of life above all others that it would be most apt to occur. If, again, we have to deal in this disease with a resumption of the fetal mode of blood formation with the appearance of megaloblasts in the blood, or, at all events, in the marrow, as Ehrlich teaches, surely it is in the child, who is but so little removed in time from the fetal state, that such a retrograde metamorphosis would be most prone to manifest itself.

Nor are children exempt from those special destructive influences which have sometimes been invoked to explain the disease. Oral sepsis is a frequent and familiar condition in them, and is believed by many to be a common cause of secondary anæmia; the parasitic anæmias also, which may so closely simulate the genuine disease, find striking illustration, even in the earliest years of life.[1] Whatever the explanation of the comparative immunity of young children to pernicious anæmia may be, it is a striking fact in the natural history of the disease which must always be reckoned with in any attempt to account for its etiology."

Secondary Anæmias. The child shows a great tendency to become anæmic when exposed to deleterious influences. The hæmoglobin, as in adults, almost always suffers first. We have then in the red cells a tendency to irregularities and to inequalities in size, and the occurrence of nucleated red cells. In the severe forms, leukocytosis is apt to develop, often as a result of a complicating disease, such as pneumonia, when the leukocytosis is of the polynuclear type. In certain instances, however, secondary anæmia is accompanied by an exaggeration of the normal excess of lymphocytes. The frequency of this, Hutchinson thinks, has been overrated. Leaving out of consideration cases of severe rickets with splenic enlargement it is chiefly anæmias, associated with chronic gastrointestinal disturbances, in which lymphocytosis is apt to occur. If, as has been supposed, the lymphocytes are chiefly concerned in the absorption of food from the intestine, this may be looked upon as an exaggerated digestive leukocytosis.

Special defects in diet which are properly responsible for the anæmia are: 1. Poverty in the amount of iron. 2. Deficiency in proteid. Influences leading to secondary anæmia by causing increased destruction of the blood are most frequently the acutely infective diseases. Rheumatism is especially active in this direction. Particularly when accompanied by pericarditis or endocarditis, the blood cells diminish very rapidly. Diphtheria, also, is attended with severe blood destruction; here there is a tendency for myelocytes to appear in the blood, which is a bad sign. Syphilis, tuberculosis, and chronic diarrhœa are often causes; they increase blood destruction and interfere with blood formation.

Infantile Scurvy. Histological examination of the blood and bone-marrow in this condition has revealed little. Chemical analysis of the blood is difficult as it requires so much blood. It has been stated that the disease is the result of a faulty diet, but whether the fault is a positive or a negative one has not been decided. Some have believed that there was

[1] See Podwissowky, Jahrbuch f. Kinderheilkunde, Bd. xxix. p. 223; see also case due to tænia, Pediatrics, April 15, 1896.

some poisonous constituent (ptomain) in the food, especially tinned food; others have attributed it to some mysterious effect of sterilization. Hutchinson attempted to solve the problem as follows: Children with scurvy were kept on the same diet as that taken when the disease was acquired, and to this diet certain substances were added. By the addition of fruit-juice there was obtained a distinct curative influence which showed that the diet lacked something. He next attempted to administer the individual constituents of the fruit-juice, and it was found that the non-crystallizable or colloid constituents (obtained by dialysis) were without curative effect. The crystalline constituents were found to be curative. The administration, however, of an artificial mixture of the vegetable salts found in fruit-juices was not satisfactory, though it was of some slight beneficial effect.

He thinks the conclusion is provisionally justified that the defect in blood which causes the symptoms of scurvy is a poverty in vegetable salts. It is probable, too, that the citrates are chiefly concerned, three pints of milk containing 50 to 60 grains of citric acid in the form of citrate of lime. It has been shown by Corlette that the calcium citrate of milk occurs in the amorphous and more soluble form. When boiled it becomes changed into the crystallizable form, which is less soluble.

He attributes scurvy to the administration of milk that had been boiled or sterilized as the sole article of diet. Hutchinson found, however, that the administration of calcium citrate was without effect, having less therapeutical power than the artificial salts of potash. The coagulability of the blood is not diminished. According to Wright the alkalinity of blood is diminished, as one would expect, if the vegetable salts of potash were diminished.

Blood Disorders Associated with Enlargement of the Spleen. While the spleen may be of importance in the carrying on of life, its removal is seemingly without serious consequence. It is apparently established that it acts as a scavenger—removing particulate matters and the disintegrated red and white cells. Enlargement may occur if this function is unusually exercised, but this increase in size is never very great or persistent. It possesses the power of manufacturing lymphocytes as does other adenoid tissue, and this may be of importance in the child. Its duty in this regard is shared by other glands, especially the thymus, and its loss causes no reduction in the number of lymphocytes. These are, in fact, increased when the spleen is removed, and Ehrlich has said that with increase of lymphocytes, and no disease of the lymphatic glands, a functional exclusion of the spleen may be assumed.

Splenic Anæmia of Infancy. Under this heading, Hutchinson includes the group of cases of anæmia with splenic enlargement found in children from six months to two years old. Clinically these cases are

as follows: There is wasting, which may be extreme; the skin is sallow, often with a yellowish tint resembling chlorosis; there is almost always rickets, which is usually not marked; there is special tendency to affection of the cranial bones, which often show marked bosses in the frontal and parietal eminences; the liver is enlarged, but not greatly so, and the accessible glands are often palpable, but show no great increase in size; diarrhœa and bronchitis are frequent complications, and death frequently results from bronchopneumonia; epistaxis may occur, but there is no great tendency to hemorrhage; severe cases may show a petechial eruption, which is of bad omen, as few such recover.

In 42 cases congenital syphilis was present in 6, doubtful in 15, excluded in 21. Rickets was marked in 26, slight in 13, and absent in 3; 20 exhibited cranial bossing to a more or less marked degree.

Twins seem to be more liable to this complaint, and he thinks that the disease is more common in Jews, though the statistics are hard to obtain. Tuberculosis is common in the history, but probably no more so than in the usual hospital patient. The children show no greater tendency to tubercle than other children.

The blood examination shows that the red cells are reduced in number, but not greatly—2,000,000 to 3,000,000 being the average; the hæmoglobin is reduced, but not necessarily in proportion to the red cells, and, remembering the physiological lowness of the hæmoglobin, may be but very slightly reduced. Variations in the size of the red cells are common, the large sizes being often seen. Poikilocytosis is usually present, but not to a very great degree. Nucleated red cells are of frequent occurrence, but probably not to any greater extent than in grave secondary anæmias. They exhibit no constant relation to either the number of red cells or the leukocytes. An increase in the number of white cells is common, but not always the case—they may be reduced in number. It is to be remembered that between the ages of twelve and fourteen months the white cells number normally between 12,000 and 14,000. In a few cases the granular cells showed an absolute increase, but in the great majority the increase was due to an augmentation of the non-granular cells. This increase tends to affect chiefly the larger lymphocytes and mononuclears, but all grades are seen, so that differential counting is difficult. Myelocytes are present probably in all cases, if looked for—usually about 2 per cent. The eosinophiles are usually not affected, but in a few cases he has seen a marked increase of the mast cells.

The blood changes are of most importance in prognosis, the size of the spleen being of little value in this respect. The smaller the number of red cells, and the higher the leukocytosis, and the greater the number of myelocytes and large lymphocytes that are present, the more severe the condition.

Pathology. This is very obscure. The author discusses the various cases and reports on 5 autopsies of his own. Generally speaking, the chief change in the spleen in these cases may be spoken of as a chronic splenitis affecting chiefly the pulp, but sometimes invading the Malpighian bodies. There would seem to be no definite relation between the extent of the splenic changes and the degree of anæmia, but the change seems to have gone on to the greatest degree of fibrosis in the cases of longest standing. The fatty degeneration of the liver is comparable to that which one finds in all advanced anæmias, while the condition of the marrow is probably merely compensatory.

In one case, in which glandular changes were found, the condition seemed to be a chronic adenitis comparable to the chronic splenitis already described.

Concerning the nature of the disease, there are four groups of writers who hold four different views. 1. Those who consider that the splenic anæmia of infancy is not a definite disease, but merely a secondary anæmia which owes its peculiar characteristics to the fact that it occurs in the early years of life. Among these writers are mentioned Wentworth, Fischl, Morse, etc. This is the conception of the disease that I have repeatedly given in PROGRESSIVE MEDICINE and elsewhere. 2. Those who regard it as an aleukæmic stage of leukæmia. This belief has been advanced by Luzet and Troje. 3. Those who consider it as standing half-way between leukæmia and pernicious anæmia. This apparently is the opinion of Rotch, Ladd, Engel, and Ewing. 4. Those who consider that the disease is one *sui generis*. This is the idea held by Weiss and Alt, in Germany, and Fowler, Melland, and other English writers. Hutchinson inclines to the latter belief. While he admits that there is no definite relation between the size of the spleen and the blood (meaning evidently the red cells and hæmoglobin), he thinks there is a general ratio between the leukocytosis and the degree of involvement of the spleen, and that these usually vary together. The blood in this condition is distinguished by the polymorphism of the leukocytes from the blood of secondary anæmia. He admits the frequent occurrence of rickets, but insists that the severity of the rickets is by no means proportional to the severity of the anæmia, as the more severe cases may have but slight evidences of rickets and a few cases are reported—3 in his series of 42—in which no rickets was found. This is proof that rickets *per se* cannot cause the disease. The author, therefore, sides with those who would place these cases in a class by themselves for the purpose of clinical classification. He thinks that cases of splenic anæmia of the adult type are occasionally found in children, and mentions a case, reported by Hamill as being of this nature, occurring in a boy aged six years. A nine-year-old boy, reported by Rolleston, also belongs to this type.

AFFECTIONS OF THE ADENOID TISSUE. The author discusses this subject under three headings: 1. Under generalized *tuberculous adenitis* he describes two such cases with autopsies. In both there was a well-pronounced leukocytosis, chiefly of the polynuclear type. These cases are not common; they exhibit a generalized enlargement of the lymphatic glands, usually some enlargement of the spleen, a pronounced degree of general anæmia, accompanied by more or less polynuclear leukocytosis. The disease tends to occur chiefly in young subjects, runs a comparatively short course, marked by irregular fever, with periodical exacerbations.

2. *Hodgkin's Disease.* This resembles the above clinically, but the author believes is totally different therefrom. Concerning the blood picture there is some doubt. In 10 cases of which he has notes there was a polynuclear leukocytosis in 2; in 1, both the polynuclear and mononuclear forms were somewhat increased. In 5, the polynuclears were diminished; that is, the lymphocytosis was only relative. In 2 cases only was there a slight absolute lymphocytosis. Hutchinson has an idea that there is a tendency to chronic enlargement of the spleen from any cause associated with a relative excess of lymphocytes. Whether the lymphocytosis sometimes seen is found only in those cases where the spleen is markedly enlarged, cannot be said. In none of the reported cases has an examination of the bone-marrow been made. The disease is essentially one of early life, but the period of its maximum frequency is much later than that of tuberculosis.

3. *Lymphosarcoma.* He reports such a case occurring in a boy of nine years, whose blood count, as far as white cells were concerned, remained normal until periosteal growths began to appear. At this time the lymphocytes became considerably increased. This increase in lymphocytes has been noted under similar conditions by other writers. He thinks there is no relationship between the three, and disagrees with the classification advocated by Türck. Nor does he believe that a relationship exists between Hodgkin's disease and leukæmia.

The question of a relationship between lymphatic leukæmia and lymphosarcoma is one not easily settled. The connecting link between the two processes is found in chloroma.

Examination of the Blood. While nothing especially new has been presented during the past year upon this subject, certain modifications of methods generally employed have been published which are worthy of note. These have in view either increased accuracy, reduction in time, or in the number of instruments employed. Onuf[1] gives a solution which permits of the staining and counting of the blood

[1] American Medicine, April 9, 1904, (Society Report).

at the same time. The mixture is composed of equal parts of 12 per cent. aqueous solution of formalin, 1 per cent. aqueous solution of NaCl, c. p., 0.5 per cent. aqueous solution of eosin (yellowish), Unna's polychrome methylene blue. The solution will not keep long. Unfortunately, details of the method are not obtainable, but it must be difficult to differentiate the various forms of leukocytes with a $\frac{1}{8}$ lens, the highest power that can be used with the hæmocytometer. Hewes[1] advocates the counting of the white cells from the stained specimen. He makes a count of 200 fields, and from the number of white cells found determines the presence or absence of a leukocytosis. He compared the leukocytic count obtained in this way with that found with the ordinary hæmocytometer, and the results were surprisingly close. In the blood of thirty students he found the number of cells per 100 fields varied between 41 and 90, falling below 50 in only 4 cases, and rising above 85 in 6 cases. The higher counts were always in the afternoon. From these figures a leukocytosis would be suggested if over 90 leukocytes per 100 fields were found at any time in the day; or if over 80 per 100 fields were found in a forenoon count. A finding of 50 leukocytes per 100 fields is equivalent to about 8000 per c.mm. In making a differential count by this method he divides the white cells into (1) basophiles, large nucleated lymphocytes, large mononuclear cells, and transitional cells; (2) neurophile cells; (3) oxyphile cells or eosinophile cells; (4) mast cells. He found the average in his thirty individuals: First variety, 21 to 49 per cent.; second variety, 52 to 78 per cent.; third variety, 0.5 to 6 per cent.; fourth variety, up to 1 per cent.

Hewes believes that by this method a sufficiently accurate enumeration of the leukocytes is obtainable, while the ease with which the specimens can be obtained from different cases is very evident.

In last year's review attention was called to a method of determining the presence of a leukocytosis by means of guaiac. Klein[2] has investigated this question. Brandenburg had noticed that pus, leukæmic blood, and normal and leukæmic bone-marrow gave the guaiac reaction, while normal blood possessing lymphocytes did not. He was inclined to look upon the reaction as being peculiar to the neutrophile leukocytes. Klein added water to a few drops of blood, then centrifuged the mixture, and collected and dried the residue on white filter-paper. The addition of a drop of tincture of guaiac to this gave a blue color, and this was found to be true in any blood either normal or pathological. The reaction was stronger in proportion as more neutrophile leukocytes were present. He concludes that the difference in reaction between normal

[1] Boston Medical and Surgical Journal, December 29, 1904.
[2] Folia Hematologica, 1904, No. 2, vol. i. p. 71.

and pathological blood on the one side, and mixed-celled leukæmic blood and bone-marrow on the other, is purely a quantitative one.

The larger number of the more recent staining solutions are modifications of the Romanowsky combination of methylene blue and eosin.

The great advantage consists in the ease and rapidity of fixation, together with the facility with which the stain can be made up. Baumgarten[1] gives a résumé of the various modifications which have been advocated since 1891, and the number is surprisingly large. Most of these are supplied in the form of a powder, which can be diluted with alcohol at will to form the stain, or are supplied already prepared by the chemists. Harlow[2] comments upon the lack of uniformity in these preparations, frequently finding it difficult to get a methyl alcohol which would dissolve the powder of the Jenner, May, Grünwald, or Wright stain so as to give uniform results. He therefore advises the following solutions as being easy of employment, rapid in action, and inexpensive. Solution No. I. Eosin (Grübler's pure French, or an eosin furnished by Bausch & Lomb), 1 gram in absolute methyl alcohol, 100 c.c. Solution No. II. Methylene-blue, 1 gram in absolute methyl alcohol, 100 c.c. The method of employment is as follows:

1. A fresh-spread cover-glass (or slide) taken in the usual manner.
2. Dried in air only.
3. Preparation held in self-closing cover-glass forceps, covered with as much eosin as it will readily hold without draining, allowing same to remain one minute.
4. Eosin rapidly decanted (shake off the surplus). Do not wash the spread in water, and do not allow it to become dry by evaporation.
5. The moist specimen is quickly covered with the methylene-blue solution, allowing to stand about one and one-quarter minutes (different blues require a few seconds more or less than this).
6. Wash gently in ordinary pure water (best to wash or dip spread in a glass of water rather than in a strongly running stream from tap).
7. Dry between layers of filter-paper and mount in balsam.

Enumeration of the Blood Platelets. Comparatively little study has been given to the behavior of the blood platelets in man under the various pathological conditions. Recently, Helber[3] has devised a method for their enumeration, and gives his results in normal and morbid states. His apparatus consists of a counting chamber similar in all particulars to the Zeiss hæmocytometer, except that the chamber is only 0.02 mm. in height. A special pipette is also necessary, made like the usual white blood pipette, but marked at 1 and 31, thus giving a greater dilution. The

[1] American Medicine, January 2, 1904.
[2] American Journal of the Medical Sciences, April, 1904.
[3] Deut. Archiv f. klin. Med., Bd. lxxxi. p. 316

diluting solution is a 10 per cent. solution of sodium metaphosphate, which must be made fresh every third day, and always filtered before using. The ear having been cleaned in the ordinary way, is pricked and the blood drawn up to point 1, and then the pipette is filled with diluting solution up to point 31 and well shaken. In satisfactory preparations the fluid in the ampulla of the pipette is bright colored; if otherwise, it must be discarded. Care must be taken not to squeeze the ear when puncturing it. When prepared in this manner, the field shows varied characteristics. The red cells are intact, and show no rouleaux formation. Between the red cells are found small, colorless bodies, about one-third the size of the red cells, of a roundish, oval shape, which refract the light, and show darker spots near the periphery. These are fairly regularly distributed, and are distinguishable from each other. Still larger platelets, about one-half the size of a red cell, are seen, which are probably swollen. Not all of the platelets are round or oval, a portion, especially when some slight injury has occurred, being irregularly notched. The white cells, owing to the smallness of the counting cell, are present in very small numbers. Preparations in which the plaques form distinct heaps of six or eight and the blood cells are agglutinated should not be used for counting purposes.

The Behavior of the Platelets in Healthy Men. In twenty-four healthy men the number of platelets, red and white cells, was determined. No relationship was found between the three. The smallest number was 192,000; the highest was 264,000; the average, 228,000. In two students fasting thirty-six hours, one case showed a diminution of platelets at the end of twenty-four hours, but returned to normal at the end of the thirty-six. In the second case there was an increase in the beginning. The number of red cells diminished in both cases. By very rich diet during thirty-six hours there was a moderate diminution in both cases. The author thinks that the taking of food has probably but little effect on the number of platelets.

Helber examined a number of cases of *anæmia* as to the condition of the plaques. In one case of uterine hemorrhage, in which the red cells were reduced to two and one-half millions, the plaques showed a slight increase. In 4 cases of simple anæmia he found a distinct increase. In severe anæmia and poikilocytosis of moderate grade he found a distinct increase in 3 cases. One of these could not be observed for any length of time, but the other two showed distinct improvement under treatment. In two further cases with marked changes in the red cells the platelets were found to be under the normal. In neither of these was improvement obtainable. The platelets were normal in chlorosis and pseudoleukæmia. In a case of hemorrhagic purpura he compared the number of the platelets with the coagulation time and found there was an appar-

ent relation between the two. On October 19, 1903, when the platelets numbered 40,000, the coagulation time was nine minutes; on October 29th, when the platelets numbered 60,000 to 64,000, coagulation time was seven minutes; November 10th, platelets 180,000, coagulation time four minutes. In mild cases of tuberculosis the number was normal. In five moderately severe cases there was a distinct increase. In three cases of cancer of the stomach the number was increased; and also increased in two cases of contracted kidney with œdema.

In heart disease he found a normal number, as well as in chronic gastric and intestinal disorders, and in hysteria and neurasthenia. In gangrene of the lung, empyema, and post-typhoid spondylitis he found an increase. In chronic disease shortly before death he found a diminution. In croupous pneumonia he found a diminution before and an increase after the crisis. In typhoid there was a diminution during the continuance of the fever, and a marked increase from the beginning of convalescence.

Leukocytes and Leukocytosis. The most important point in the study of the white cells is the differentiation of the several varieties, as there is a general belief that certain special diseases show special leukocytic formulæ. Following the teaching of Ehrlich the leukocytes are divided into classes depending upon the presence or absence of granules, and the staining reaction of these granules—whether they are acid, basic, or neutral. This staining reaction, together with the size, shape, and number of nuclei in the cell, has served to distinguish between the various colorless elements of the blood. Within the past few years the growing use of eosin-methylene-blue stains in varying mixtures and chemical combinations has brought to light the existence of granules in cells hitherto thought to be non-granular, so that differentiation in some cases, by certain stains, has been difficult. Especially is this the case with the so-called azure granules which are claimed to be present in the lymphocytes, hitherto looked upon as the type of non-granular cells. This subject has been treated extensively by numerous writers, among whom may be mentioned Michaelis and Wolf. Wolf[1] brings up the topic anew. He insists that at present it must be admitted that azure granules are as constant an occurrence as other so-called specific granules, and in consequence the distinction between granular and non-granular cells is no longer possible. Distinction can only be made between azure granulation and other varieties of granulation.

He summarizes his beliefs as follows:

1. The division of the leukocytes according to their granulations is to be maintained as the objections urged against this principle are untenable.

[1] Zeit. klin. Med., Bd. lii. Hefte 3 u. 4.

2. The so-called neutrophile granules may show the most varying shades between blue and reddish-violet in the same blood. The "neutrophile" of the granules is not always the same when different staining methods are employed (for example, with the triacid stain and with the May-Grünwald mixture). These various shades of the neutrophile granules are due to the fact that the granules take up not only the neutral salts, but some of the disassociated coloring material as well.

3. The differentiation of different forms of granulation under neutrophile granules is not to be recommended, as the same process would have to be adopted with eosinophile granules, and the comprehensibility of the whole system would be lost. From the standpoint of utility it is best to maintain the designation "neutrophile" for the special granulation in man.

4. The azure granulations in the lymphocyte and mononuclear leukocytes present a peculiar condition of solubility analogous to mast-cell granulations. This explains the fact that azure granules are not found in all lymphocytes and mononuclear leukocytes, as is the case with specific granulation. The dissolved granules leave often only negative granule forms in the protoplasm of the cells in which they were deposited.

5. The azure granulation of the lymphocyte is to be looked upon as a specific leukocyte granulation, as are the neutrophile and mast-cell granules.

6. There are, therefore, in the blood no non-granular leukocytes; the separation into granulocytes and lymphocytes is no longer tenable.

7. Since the leukocytes are divided according to their granulations, from presence of the same azure granulation in lymphocytes and mononuclear leukocytes, the near relation of these two types of cells is evident.

At this point it may be well to mention the theories advanced by Arneth.[1] These articles are only preliminary extracts from a book upon the neutrophile leukocyte in infectious diseases which has not been accessible to the reviewer. The gist of his theory is to the effect that the important cellular elements from the standpoint of the investigator are the neutrophile leukocytes, which make up the larger proportion of the white cells. Starting out with the statement that the normal numerical variation of the leukocytes is between 5000 and 6000, instead of between 5000 and 10,000, as is generally accepted, he goes on to state that the method of study usually pursued fails to find out the important blood changes that result from disease. He insists that the number of leukocytes is of far less importance than the proportion of the various classes into which he has divided the neutrophile cells. Depending upon the number of the leukocytes, he recognizes:

[1] Deut. med. Woch., 1904, Nos. 2 and 3; and Münch. med. Woch., 1904, No. 25.

1. Hyperleukocytosis or leukocytosis, which may be (*a*) isohypercytosis or (*b*) anisohypercytosis.

2. Normoleukocytosis or normocytosis, which may be (*a*) isonormocytosis or (*b*) anisonormocytosis.

3. Hypoleukocytosis or hypocytosis, which may be (*a*) isohypocytosis or (*b*) anisohypocytosis.

The neutrophiles themselves are divided into five classes depending upon the shape and number of the neuclei.

Class 1 has only one nucleus. If this is completely round it is called a myelocyte (*M*); if slightly (*wenig*) it is classed as *W;* if deeply (*tief*) indented it is classed as *T*.

Class 2 has two nuclei or portions of nuclei. There may be distinct round nuclei (*kern*), which he abbreviates as *K*, or loop (*schlingen*) abbreviated as *S*. Under this class there are three divisions—viz., (*a*) 2 K; (*b*) 2 S; 1 K 1 S.

Class 3. This is composed of neutrophiles with three nuclei or three nuclear particles, and has four divisions. (*a*) 3 K; (*b*) 3 S; 2 K 1 S; 2 S 1 K.

Class 4. Composed of neutrophiles with four nuclear particles, and has five divisions (*a*) 4 K; (*b*) 4 S; 2 K 2 S; 3 K 1 S; 3 S 1 K.

Class 5. Composed of neutrophiles with five or more nuclear particles. These are, of course, counted with an oil immersion, and one hundred neutrophiles are enumerated and set down in columns corresponding to the arrangement of the nuclei. Under the influence of disease the effect first noted is a disappearance of the divisions containing the largest number of nuclear particles, the fifth class disappearing first, then the fourth, and finally the third. Arneth has never seen disappearance of the second and first classes.

The field of study opened up by these investigations is an interesting one, but the amount of information at hand is too small to justify opinion. From the preliminary reports there is an apparent neglect of study of the remaining leukocytes, which is certainly not justifiable in the light of our present knowledge, but this may not be evident in the monograph.

Experimental Leukocytosis. There have been many theories advanced to explain the phenomena of increased white cells in the peripheral blood, but none of them are entirely free from objection. Studies along this line are therefore of importance. Silverman[1] has conducted a series of experiments upon dogs, with a view of determining the effects produced upon the blood of these animals by the intravenous injection of putrid horse serum; what relation existed between body temperature and leukocytes; and how changes in the walls of the blood-

[1] University of Pennsylvania Medical Bulletin, March, 1904.

vessels affected the latter. The theories of leukocytosis are: The chemotactic theory, which considers the excess of white cells to be the result of the strong attraction exerted upon the large store of leukocytes, all present in the bone-marrow, by toxins or micro-organisms. The conception does not take into account any actual increase in the leukocytes—only a difference in distribution. Römer accepts the idea of chemotaxis in leukocytosis, but believes that a multiplication occurs by amitosis in the blood current. Limbeck having found an inflammatory leukocytosis only when associated with a purulent exudate at the point of inoculation, attributed the increase to the local exudate. Löwit looks upon leukocytosis as a process of regeneration. Silverman first determined the actual and relative number of leukocytes in a number of dogs kept under the same conditions, and found that wide variations occurred in different dogs, and in the same dog during different periods of the day. His injections of the putrid horse serum varied in amount from 18 drops to 3.5 c.c., and were made into the jugular vein. The cells were counted and stained in the usual way. With a view to determining the cause of the initial hypoleukocytosis he tried the effect of dilatation of the vasomotor system by means of the nitrites. The results of his investigations are given briefly and clearly in his conclusions, which are appended.

1. The injection of putrid horse serum causes a primary hypoleukocytosis, in which the polymorphonuclear neutrophiles are diminished and the mononuclear elements increased, followed by a secondary hyperleukocytosis, which is characterized by (*a*) a great increase in the polymorphonuclear variety; (*b*) an appearance of cells on the border-line of myelocytes, as well as an actual presence, in the severe cases of leukocytosis, of mononuclear neutrophiles in small numbers; (*c*) a deficiency of hæmoglobin which was found in 60 per cent. of the dogs experimented upon, associated with an appearance of normoblasts in the blood.

2. There is no definite relation between the leukocytosis and the rise of temperature; the grade of the leukocytosis is not proportionate to the height of the temperature, and the maximum rise in one occurs independently of that of the other.

3. Inhalations of amyl nitrite and injections of potassium nitrite cause a primary hyperleukocytosis in a very short time, due probably to the dilatation of the capillaries.

4. Potassium nitrite administered before the injection of peptone lessens the duration and the extent of the disappearance in the number of the leukocytes during hypoleukocytosis, and thus disproves that the leukocytes are destroyed, as Löwit supposes.

5. The results of the foregoing experiments lead to the belief that the decrease in the number of the leukocytes in the beginning of leukocytosis

is due to their obstruction and imprisonment, caused by the narrowing in the lumen of the capillaries, owing to the irritation of the endothelium by foreign toxic substances.

LEUKOCYTOSIS FROM DRUGS. Somewhat along the same line are the investigations of French,[1] made upon himself with some of the drugs which are said to produce an increase in the number of leukocytes in the blood. He first determined the normal variation in his own leukocytes, which were found to range between 5000 and 13,000 per c.mm., which is rather high according to modern views. Nuclein by the mouth and hypodermically caused no change, nor did injections of sodium cinnamate. Injections of collargol were followed by leukocytosis, but the accompanying symptoms were such as to make him think it of doubtful value in a patient already ill. After injection of 30 mg. there was no change in the white-cell count for ten hours; twelve hours after injection the number was 14,375; twenty-four hours after, 16,250; and reached a maximum of 32,187 thirty hours after injection, and then rapidly fell to normal. Twenty-four hours after injection he began to feel pain in the back and limbs, and headache, but without loss of appetite. The temperature rose to 99° thirty hours after injection, and reached 101° at the fortieth hour, returning to the normal after sixty hours. The headache persisted for four days.

LEUKOCYTOSIS IN PREGNANCY AND THE PUERPERIUM. A knowledge of the behavior of the leukocytes during the latter month of pregnancy and in the puerperium is of great importance. At this time the liability to infection is increased and the diagnosis as to whether pus is present or not is often hard to make. To know the value of leukocytosis present in a given case it is necessary to understand the condition of the white cells normally. Lobenstine[2] reports some investigations upon this subject. In 50 cases examined during the ninth month of pregnancy the average number of leukocytes was 10,600, the lowest count being 5400 and the highest 18,400. The average was 11,854 in primiparæ and 9346 in multiparæ; leukocytosis was absent in nine cases. In these patients the effect of digestion on the leukocytes was also noted, and it was found that a digestive leukocytosis appeared in thirteen cases; no change in one case; an actual decrease took place in six.

Counts were made on fifty healthy patients on the third day of the puerperium, the local discharge and the temperature being normal in each instance. The average count was 12,400; highest, 20,400; lowest, 5600. Average in primiparæ, 13,200; in multiparæ, 11,600; absent leukocytosis in eight cases.

[1] Medical Press and Circular, May 11, 1904; Lancet, April 30, 1904.
[2] American Journal of the Medical Sciences, vol. cxxviii. p. 281.

From the above it is evident that in the latter months of pregnancy and the puerperium there is a slight tendency to leukocyte increase, which is more marked in primiparæ. Lobenstine thinks this increase is due to a natural augmentation of the metabolic processes.

The occurrence of a leukocytosis in the latter months of pregnancy has come to be looked upon as normal, and the investigations of Zangemeister and Wagner and of Pray, Senger, and others[1] have all confirmed this belief. As can readily be understood, this physiological increase of the white cells tends to nullify the finding of a leukocytosis as a sign of a complication in the latter months of pregnancy unless the leukocytosis be beyond 20,000. Pankow,[2] however, maintains that leukocytosis in the latter months of pregnancy is unusual, though he agrees with the other observers that there is a leukocyte increase during labor, which gradually disappears, the count coming to the normal about the fourth or fifth day.

In pregnancy, as in other conditions, the normal numerical value of the white cells is by no means well settled. While most modern observers believe that the normal count is always under 10,000, the investigations of Hewes and French[3] are rather at varience with this opinion. Hewes found in thirty healthy young men that the number of white cells varied between 6200 in the morning and 14,800 in the afternoon, while French, in experimenting upon himself, found variations between 5000 and 13,000. In spite of this a continued study of the changes in the white cells under normal and pathological conditions may serve to bring some new things to light.

The results of studies made during certain complications of labor are less contradictory than those on the normal. Thus, Lobenstine[4] in his study of 10 cases of *eclampsia* found that the leukocytes were increased as a result, he thinks, of the toxin present. He notes that there seems to be a relationship between the degree of the toxicity and the number of leukocytes, and that this increase of white cells is an index of the resisting power. He also states that a sudden increase in the leukocytes usually indicates an increase in the severity of the condition. Carmichael[5] comments on the fact that in eclampsia an increase in the leukocytes is often accompanied by a diminution in the severity of the disease. Both agree that the leukocytes are increased. The theory of retention of the toxins as being the cause of the increase of leukocytes in Lobenstine's cases may be true, and seems plausible. But it must be remembered that some observers—notably Zangemeister and Wagner—insist that the mechanical processes of labor are of paramount importance

[1] PROGRESSIVE MEDICINE, June, 1903.
[2] Centralbl. f. Gynäkologie, 1904, No. 11.
[3] Loc. cit.
[4] Loc. cit.
[5] British Medical Journal, December 5, 1903.

in the leukocyte increase. Thus they found that the leukocytes were higher when the labor was prolonged, as from a narrow pelvis, and that instrumental interference, as the introduction of a colpeurynter, caused a higher count. In practically all of Lobenstine's cases an *accouchement forcé* was performed, and this, together with the prolonged strain of repeated convulsions, ought to have much the same effect as the muscular efforts in the expulsion of the fœtus. Dutzmann[1] is of the opinion that eclampsia is a true infection because of the behavior of the leukocytes.

LEUKOCYTOSIS IN APPENDICITIS AND GYNECOLOGICAL CONDITIONS. These are spoken of together as in both instances there is usually an involvement of the peritoneum of greater or less extent. There is a very great difference of opinion as to the value of the leukocyte count in the pelvic inflammations which come under the care of the gynecologist. Pankow[2] is the most enthusiastic believer in the diagnostic value of the leukocyte count. According to his idea, in all cases in which there is a persistent count of over 10,000 the presence of pus in the pelvis should be assumed unless other explanation for this count be at hand. Pus cannot be excluded even when there is no leukocytosis, as the abscess may be well encapsulated. In this latter opinion Kirchmayer[3] agrees, but is much more conservative in his other statements. Thus he states that a leukocytosis of 30,000 points with great probability to the presence of pus, while a moderate increase in the white cells is of but little diagnostic value. Dutzmann[4] is convinced of the value of leukocytosis as an aid to the diagnosis of inflammations of the adnexa, and suggests that in doubtful cases the glycogen reaction may be of great value in determining the presence of pus. Both Pankow and Dutzmann comment on the fact that torsion of the pedicle of an ovarian cyst may cause leukocyte increase without the presence of pus. Pankow thinks this may be due to peritoneal irritation.

Concerning the value of leukocytosis in appendicitis numerous articles have been published. Among these may be mentioned those of Head,[5] Federmann,[6] French,[7] Jamieson and Stacy,[8] Sprengel.[9] The consensus of opinion points to the belief that in appendicitis the leukocyte count is of importance both in prognosis and diagnosis, but should always be looked upon as one of the important symptoms. According to Federmann, each case has a typical leukocyte curve, which varies according to the severity

[1] Monatsschrift f. Geb. u. Gyn., Bd. xviii. Heft 1.
[2] Centralbl. f. Gynäkologie, 1904, No. 11.
[3] Wien. klin. Rundschau, 1903, No. 11. [4] Loc. cit.
[5] Northwestern Lancet, February 15, 1904.
[6] Mitth. a. d. Grenzgeb. d. Med. u. Chirug., Bd. xviii. Heft 2.
[7] The Practitioner, June, 1904.
[8] Australasian Medical Gazette.
[9] Münch. med. Woch., 1904, No. 37.

of the disease. Usually in the first two days the count is below 20,000 in the simple cases, being higher in more grave cases. Marked symptoms with a low count indicate in this stage severe intoxication, and is an unfavorable sign. A high count on the third to fifth day indicates pus without tendency to encapsulation, and hence operation is necessary. A falling count with increased severity of the symptoms is a bad sign. A count of over 20,000 after the first week shows an encapsulated abscess. Head points out that the leukocyte count is valuable in determining whether the appendicitis is catarrhal or suppurative, and in the majority of cases indicates this distinction. It also shows whether or not the disease is spreading, and is of great aid in helping to differentiate appendicitis from other conditions which give somewhat similar symptoms, as calculus, gallstones, typhoid fever with appendicular symptoms, etc. French calls attention to the great variability of the counts, and thinks too much stress may be laid upon this symptom in deciding as to operation. From his own 83 cases and a number collected from the literature he finds that the lowest number of cells which has always indicated pus is 32,000. This is considerably higher than the figure given by Da Costa and others as being indicative of suppuration in appendicitis. French takes as a criterion cases with a high leukocyte count which have subsided without operation, and notes that many with a count of 20,000 have subsided spontaneously, while others with a count of 15,000 have been shown to have pus. This observer is inclined to lay more stress upon the so-called "rising count" than upon the total number.

The entire subject of surgical leukocytosis is well reviewed by Julliard,[1] and in the main agrees with the findings above given. He claims that *suppuration in the liver* gives a higher leukocyte count than abscess in any other part of the organism, often reaching between 45,000 and 90,000. In cancer of the stomach he lays stress upon the absence of a digestive leukocytosis in the differentiation between this condition and gastric ulcer. It is proper to recall that this failure of post-digestive leukocytosis in gastric carcinoma has been thought to be due simply to pyloric obstruction, and it was found that even in cancer, if the pylorus was unobstructed, the post-digestive increase could be noted, while in other conditions causing obstruction no post-digestive increase took place. Realizing what a small part is played by the stomach in absorption and assimilation of food, it would seem very plausible that the increase of leukocytes would occur when the food reached the small intestine. At all events, comparatively little attention has been given to the leukocytosis of digestion, except to realize the bearing it may have upon counts made for diagnostic purposes.

[1] Revue de chirurgie, vol. xxiv. Nos. 5, 6, 7, 8.

LEUKOCYTOSIS IN SURGICAL AFFECTIONS. Several publications dealing with this topic have appeared. That of Julliard[1] has already been referred to. Tuffier[2] emphasizes the importance of blood examination in surgery. He finds in *cancer of the stomach* that there is a leukocytosis of 10,000 to 15,000 affecting chiefly the polynuclear cells. These findings are not invariable, a point which is also emphasized by Kurpjuweit.[3] Tuffier finds that hyperleukocytosis occurs earlier, is more constant, and is generally higher in sarcoma than in cancer. He also finds in liver abscesses pronounced hyperleukocytosis with marked polynuclear increase and no eosinophilia, while in hydatid cyst the leukocytosis is not well marked (10,000 to 12,000), and there is a distinct increase in the eosinophile cells. The behavior of the mononuclear cells in gastric carcinoma has been studied earlier by Strauss and Rohnstein, who found that they had a tendency to be low in contradistinction to pernicious anæmia, where the mononuclears are high. This finding had been verified by Kurpjuweit, but he reports one peculiar case of gastric carcinoma in which immediately before death the mononuclear leukocytes amounted to 33 per cent.; the lymphocytes 32 per cent., and the polynuclear cells 35 per cent. The autopsy showed nothing to account for this change in the blood picture, and the author explains the occurrence on the ground that a large portion of the tumor broke down suddenly, with a rapid formation of toxins and coincident effect on the leukocyte formula.

DIABETES MELLITUS.

Etiology of Diabetes. During the past few years there has been a gradually increasing belief in the theory that the pancreas is chiefly at fault in diabetes mellitus. The work of Opie, confirmed by Weichselbaum and Stangl and others, has shown that in a considerable number of the cases coming to autopsy changes are found in the islands of Langerhans leading to their complete destruction. In one very acute case there was found a hyaline transformation of these bodies. The pathological changes of the pancreas in diabetes mellitus are discussed by Pearce[4] in a symposium on diabetes. In five of the six cases he reported upon changes in Langerhans' islands could be detected—four being of the intracinar type of pancreatitis, with involvement of the islands, and one showing the hyaline transformation above referred to. The sixth case was normal as far as the pancreas was concerned. Not only is diabetes caused by primary disease of the pancreas but secondary changes which act upon the islands to their detriment are also produc-

[1] Loc. cit.
[2] Presse médicale, 1904, No. 89.
[3] Deut. med. Wochen., May 21, 1903.
[4] Albany Medical Annals, April, 1904.

tive of diabetes. Thus in thirty cases of cancer of the pancreas studied by Pearce, glycosuria was present in three—one being true diabetes, another intermittent glycosuria, and in the third there was no data as to the glycosuria other than its presence. In the first, intracinar pancreatitis with involvement of the islands was found; in the second the pancreas was apparently normal in the involved portion; in the third there was not sufficient amount of the organ for study. While stating that he does not advocate the origin of all cases of diabetes from the pancreas, Pearce asserts that there is a definite basis for ascribing a certain number of cases of diabetes to pancreatic lesions. In the case above mentioned where the pancreas was found to be normal he suggests the possibility of a functional deficiency of the islands. This brings up the subject of the functions which are carried on by the islands, and inasmuch as they have no outlet by way of a duct, this function is thought to be the production of a secretion which is given directly to the blood—an internal secretion.

Pearce has found that the islands are separated from the primary acini of the pancreas at an early age in their development and become anatomically independent, having a blood supply proportionally in excess of that of the acinus. He believes this anatomical differentiation is an argument in favor of a special function on the part of the islands. As to cases of diabetes mellitus apparently dependent upon changes in organs other than the pancreas, he mentions forms of glycosuria associated with acromegaly, with cirrhosis of the liver, with arteriosclerosis, and especially the diabetes of hæmochromatosis as appearing, in the light of recent investigations, to have a relation to disease of the pancreas. In the acromegalic diabetes he quotes the suggestion of Opie that the induration characteristic of the disease may occur in the pancreas as well as in other parts, and when sufficiently advanced produce diabetes. In arteriosclerosis the changes may affect the nutrition of the pancreas. In cirrhosis of the liver there may be a coincident chronic pancreatitis from the same cause. In the *bronze diabetes* Opie has found the intracinar type of pancreatitis in one case seen by him. Diabetes from nervous lesions have been explained by Naunyn on the ground that through the secretory or nutritive nerves we have a disturbance of function in the organ presiding over the carbohydrate mechanism. The diabetes resulting from the administration of phloridzin is due to injury of the renal epithelium, while that in exophthalmic goitre is unexplained; but Opie has noted that no study of the pancreas has been made in the cases of diabetes in Basedow's disease.

The opinions of Pearce are the ones now generally held—viz., that diabetes is more frequently due to disease of the pancreas, and particularly the islands of Langerhans, than has been generally believed, but

may also be the result of lesions in other organs. But there are those who object to this theory of the casual relation of the islands to diabetes, among whom may be mentioned Schmidt, whose views have been given in a previous number of PROGRESSIVE MEDICINE. One of the great difficulties in the solution of the problem is the proper classification of glycosuria. The occurrence of substances in the urine capable of reducing Fehling's solution is not uncommon in many conditions, and even when this is proven to be glucose the symptom may be transitory, or, if constant, the general condition of health may be unimpaired for a long period of time. This variety of glycosuria shows no special difference from that found in so-called "true" diabetes, which generally terminates in death in a comparatively short time. De Renzi[1] believes there are two distinct types of diabetes. The smaller number belong to the type in which the pancreas or some other organ is diseased, and in these the organic changes have so progressed before the diabetes is diagnosticated that cure is out of the question. The second and larger variety of diabetes belongs to the same class of diseases as does gout. We have here to do with a condition of delayed or slow metabolism—*bradytrophism*, also known as arthritism. This state of the body may be congenital or acquired, the latter being the result of overeating, especially of the carbohydrates; the former is due to dietetic errors on the part of the parents. The children of such parents inherit a limited range of organic activity, and they are less able than their fellows to endure errors in diet. The metabolic activity may be so lessened that there is difficulty in handling the usual food, and excesses so slight as to be within the normal range of the average individual of the same age and size may lead to glycosuria. This theory of inherited inability to metabolize carbohydrates has already been advanced by Lorand.

As the prominent symptom of diabetes is the excretion of sugar in the urine much attention has been given to the study of carbohydrates metabolism by those interested in diabetes. This phase of the subject has been discussed by Edsall.[2] In his review of the subject he takes up the subject of glycolytic ferments, the investigation of which has been so active in recent years. Lepine some years ago stated that he had proved the presence of glycolitic ferment in the blood, which is normally furnished by the pancreas, and is absent or reduced in diabetes. Later on this view, was denied and in the main given up by Lepine himself, and at present he tends to the belief that while normally sugar circulates in a combination which cannot pass the kidneys, in pancreatic diabetes this combining substance is insufficient, and the sugar which is free in the blood can readily pass the renal epithelium. It has been thought

[1] Berlin klin. Woch., Nov., 1904.

[2] Albany Medical Annals, April, 1904.

that the pancreas and other tissues produce a glycotic ferment which when distributed would permit the occurrence of glycosuria. The great objections to the investigations published is the uncertainty as to the proof of the presence of a ferment. Bacteria when present can cause oxidation, and it has been shown by De Brun that sugars may undergo stereochemical changes in even weak alkaline solutions, and thus create error as to the amount of sugar in these solutions. Other observers have published experiments to show that juices from various organs possess glycolytic power, as muscle and liver as well as the pancreas. Still later it has been shown by Cohnheim that the juice of muscle or pancreas alone possessed no glycolytic action, but when combined a very distinct sugar-destroying power was developed. This finding brings up the probability of there being an inactive ferment in the muscle which is rendered active by the presence of the pancreatic substance on the theory of Ehrlich of a complement and intermediary body. Edsall sums up his discussion as follows: "The pancreas possesses an extremely important influence on carbohydrate metabolism, and it is not known in what way this organ exerts its influence, except that it probably does not do so merely through providing a glycolytic ferment, but possibly through influencing the glycolytic activities of other tissues. Finally, it is becoming increasingly evident that carbohydrate metabolism is intimately associated not only with the pancreas, but also with other tissues, and it is constantly assuming greater complexity than it has generally been conceived of as exhibiting. At present one is justified in suspecting, at least, that carbohydrate metabolism is of a complexity that is comparable with that of proteid metabolism."

The investigations upon the fate of carbohydrates in the human organism have been of extreme interest and have led to the recognition of certain facts of importance in prognosis and treatment. Mandel and Lusk[1] believe that the relation of the amount of dextrose to that of nitrogen excreted in the urine is of distinct diagnostic value. In absolute diabetes in dogs (after phloridzin injections) this ratio of D: N was found to be 3.65 : 1. If this proportion is found in man on a simple fat meat diet it indicates complete intolerance for sugar and is of bad omen. With a less proportion improvement is always possible. These writers believe that the presence of acetone and diacetic and oxybutyric acids in the urine need not always be alarming, as patients have been known to improve considerably after excreting 5 to 6 gm. of acetone and 40 gm. of oxybutyric acid in the twenty-four hours. Also, they believe that there is no reason to think that the fats participate in the production of sugar even when the D : N ratio is higher than 3.65 : 1. It is probable

[1] Deut. Archiv f. klin. Med., Bd. lxxxi. No. 596.

in such an event that the sugar is derived from proteid taken the day before, since the nitrogen is always more rapidly excreted. From patients fed upon oatmeal 85 per cent. of the starch was recovered from sugar, and from those fed on levulose 80 per cent. appeared as sugar. In depancreatized dogs the D : N ratio never equals more than 2.8 : 1, and it is thought that after phloridzin injections a compound of dextrose and proteid is decomposed which is normally burnt up in animals showing the 2.8 : 1 ratio.

The work of Beddard and Spriggs[1] upon the metabolism in severe diabetes is important in pointing out the conditions obtaining under dietary regulations in advanced cases. Bad effects such as nausea, vomiting, weakness, and loss of weight with the odor of acetone on the breath which follows a too rapid withdrawal of carbohydrates from the food of a severe diabetic are associated with precisely the same metabolic changes and symptoms of acid poisoning as in coma itself, to which they are known to sometimes lead. The most important result in the urine is a rapid rise in the proportion of ammonia. The percentage of nitrogen excreted in this form rose in one case in ten days from 7 per cent. to 29 per cent.; the alkalinity of the blood also falls and the amount of CO_2 in it is diminished. The peccant material, therefore, does not seem to be derived from carbohydrates.

The spontaneous recovery which usually occurs is accompanied by a diuresis, but not by a fall in the proportion of ammonia. The administration of an alkali produces an opposite effect to a diabetic diet, as regards the ammonia, and causes a general improvement in the condition of the patient and a disappearance of the odor of acetone. Although an increase in the quantity of urine follows, there is no marked rise in the excretion of the sugar after the first day or two. The alkali was given in milk up to 75 gm. daily of sodium bicarbonate in four equal portions. It would seem advisable to use this drug when a patient is to be transferred from an ordinary diet to an antidiabetic. The administration of the alkali must be watched as a disturbance of digestion, diarrhœa, or œdema may be produced; the object of the alkali is obtained when the urine becomes neutral; this may be in a few days or not for some weeks. Opium caused a diminution in the amount of urine and its constituents, but none in the proportion of ammonia. Codeine had no effect on metabolism. Ferric chloride reaction was most marked on a diabetic diet and is diminished by alkali. This sign and the weight of the patient were found to be better guides to the condition of severe cases than was the amount of sugar in the urine.

Classification of Diabetes. As has previously been mentioned there is great practical difficulty in defining the precise signs and symptoms

[1] British Medical Journal, September 24, 1904.

upon which a diagnosis of diabetes mellitus may be made. Of late some attention has been given to an attempted distinction between glycosuria and diabetes mellitus, but the basis of classification offered is not entirely satisfactory. Thomson[1] states that a glycosuria existing for a year or more justifies the name of diabetes mellitus. This, however, leaves much to be desired, and the designation of cases as being "true diabetes" or as glycosuria without sharp lines of difference is scarcely scientific. We find cases recorded as transitory diabetes in which the glycosuria exists for only a short time. Thus Mann[2] describes a case in a man aged forty-five years who had diabetes insipidus which within a few weeks became converted into diabetes mellitus. The excretion of sugar lasted but sixteen days under an oatmeal diet. Later on the patient died of gastric carcinoma with pancreatic involvement. Such case reports as these are misleading.

Complications of Diabetes. Certain reports of unusual conditions occurring in diabetes are worthy of comment. Teschemacher[3] calls attention to the frequency with which *Dupuytren's contraction* may be found in diabetics between the ages of fifty and seventy. He found 33 cases of contracture in 213 diabetics examined. Only 3 of these were in women, and in only 1 case was the occupation of a kind to expose the hand to repeated injury. He attributes the condition to some toxin acting upon the nervous system. Heidenheim[4] reports the occurrence of a well-marked case of *scurvy* in a man aged sixty-seven years who had previously been well. There was nose-bleed; swollen, bleeding, and painful gums; anorexia, and bad taste in the mouth. His urine was found to contain 6.5 per cent. of sugar. The mouth condition failing to respond to ordinary remedies *formalin* (two teaspoonfuls to a wine-glass of water) was used hourly as a mouth-wash. The local effect was prompt, the general condition improved rapidly, and the sugar disappeared. Four months later there was again an attack of *fetor ex ore* and anorexia with glycosuria, but no hemorrhage, but this disappeared promptly on resumption of the formalin. Futcher[5] comments upon the infrequency of *lobar pneumonia* in diabetes. It occurred in only 3 out of 134 cases of diabetes; all three died.

Treatment. DIET. The treatment of diabetes mellitus is a favorite topic for discussion and numerous articles are published each year. In one thing all are agreed—viz., that the diet must be regulated and this regulation is usually in the direction of limitation of the carbohydrate intake. Knowledge gained from both clinical and chemical inves-

[1] Boston Medical and Surgical Journal, November 14, 1904.
[2] Berlin. klin. Woch., July 25, 1904.
[3] Deut. med. Woch., March 31, 1904.
[4] Ibid., May 26, 1904.
[5] Medical News, February 27, 1905 (Society Report).

tigation has fully demonstrated that the choice of diet must be made carefully with due consideration to the patient and his general condition. In other words, the important thing is to treat the patient, inasmuch as a diet devoid of carbohydrates cannot be kept up for any length of time.

The aim of treatment in diabetes is first to bring about the disappearance of glycosuria and then train the system to again handle a starchy diet. In other words we seek to re-establish a tolerance for the carbohydrate food. Up to the present time the best recognized method of causing disappearance of glycosuria is the interdiction of starchy food, but whether this is done suddenly or gradually must depend upon the individual case. As has already been pointed out, the too sudden removal of starch in bad cases may be productive of very grave symptoms, even coma. Williamson[1] divided his cases into three classes —mild, in which the urine can be made sugar-free by a rigid diet; those of medium severity, in which diet fails to cause a complete disappearance of sugar; the most severe form, in which the perchloride of iron reaction is present in the urine. In treatment it is of importance to know of the form of the disease, and the condition of the lungs, heart, and kidneys should be investigated. The weight should be taken periodically, and the urine and its contents in sugar recorded at least weekly. In Class I. rigid diet should be instituted, and carbohydrates should be given gradually. If the patient loses weight, or refuses to continue the diet, we must content ourselves with moderate restriction of carbohydrates, keeping the sugar excretion down to 500 grains. In Class II. a strict diet may be tried, but if the patient loses weight a small amount of bread should be given. In Class III. rigid diet is often injurious, and a small amount of bread should be allowed. As a substitute for bread Williamson prepares protein bread, casoid bread, casoid meal bread, and aleuronat and cocoanut biscuits. As a formula for making protein bread he gives: four ounces of No. 2 protein, two ounces of butter, and two eggs. Beat all together thoroughly. Divide so as to form eight small cobs and bake in oven. This is practically free from starch and often has a marked effect in reducing sugar. This may be alternated with, or combined with, or substituted by, casoid bread or casoid meal bread. The aleuronat and cocoanut cakes are made as follows: two ounces of dried cocoanut powder are mixed into a paste with a little water containing a small quantity of German yeast. This is kept for half an hour in a warm place. The fermentation decomposes the sugar and the paste becomes spongy. To this are added two ounces of aleuronat, one egg beaten, a small quantity of water, a little

[1] Lancet, January 23, 1904.

saccharin or saxin, and the whole mixed to form a paste. This is baked for twenty or thirty minutes. Milk free from sugar he makes as follows: four tablespoonfuls of cream and a pint of water are well mixed and allowed to stand in a cool place for twelve hours. The fat is skimmed from the surface of the water, placed in another vessel, and water, the white of an egg, and a little salt are added. The milk-sugar remains in the water dissolved, while the fat rises to the top.

The plan adopted by Williamson is perhaps that of the majority of observers. Oefele[1] makes objections to the usual method of withdrawing the carbohydrate from the food and increasing the fat and albumin on the ground that in many cases the body is unable to assimilate the excessive amounts of fat and albumin, as is seen by the examination of the feces. The diabetic body, Oefele says, is unable to store up sugar, and accordingly advises the administration of sugar-forming substances in easily digestible form at a time outside of the chief meals. Substances rich in cellulose and albumin or food prepared with albumin (milk) are to be omitted. Between meals he gives beet-sugar dissolved in water before and at the beginning of muscular exercise. He believes that when given in this manner the sugar can be used as a source of energy. During the past few years several publications have extolled the merits of potatoes as a diet in diabetes. Sawyer[2] recommends a bread made of bran and potatoes with their jackets on. They are then peeled and squeezed into flour with the fingers; half-pound of this flour is mixed with one-quarter pound of bran, half an ounce of German yeast, and half an ounce of butter, and one egg. After mixing the paste is allowed to stand by the fire for an hour to rise and baked in greased tins for an hour and a half. He allows potatoes to his diabetic patients and believes that the good obtained arises from the content in potash and phosphoric acid. To retain these the only proper way of cooking is by steaming with the jackets on. In other methods some of the above-mentioned ingredients are lost.

Diets of potatoes, oatmeal, etc., were fully discussed last year and attention called to the fact that the patient must be carefully studied in order to find out the special form of carbohydrate he is best able to metabolize. Recently, Stern[3] has advocated a diet of the yolks of eggs, of which he gives ten to forty daily, combined occasionally with a small amount of proteid and unavoidable carbohydrate, as in green vegetables. The rationale of the yolk cure he sums up as follows: 1. Palmitin, stearin, and olein the fat substances of the yolk occasion only small amounts of acetone bodies, and, in combination in which they exist in the yolk, yield little or no butyric acid. 2. The large amount

[1] Deut. Aerzte-Zeitung, 1902-3. [2] British Medical Journal, March 5, 1904.
[4] Medical News, October 22, 1904 (Society Report).

of lecithin supplied to the organism by the yolk tends to the restoration of the nerve forces and the amelioration of the cachectic condition. 3. There occurs in the yolk a diastatic ferment which assists in the conversion of amyloid substances introduced by the proteids and allowed vegetables. 4. A function of the yolk is stimulating the digestive secretions.

When we come to a consideration of the *drugs* advocated for the treatment of diabetes the number is many. As a rule the published cases of successful treatment with some drug or method are followed by several other publications of cases in which the lauded treatment has proved unsatisfactory. A very complete résumé of the modern methods of treatment in diabetes is given by Strauss.[1] Most of these have already been considered in former numbers of PROGRESSIVE MEDICINE. A few contributions are of interest as they deal with the scientific investigation of preparations which are secret or patented. In diabetes as in all chronic diseases the opportunities for deceiving the unfortunate patient are very great. The distaste for the rigid diet laid down in orthodox treatment makes the diabetic only too anxious to try any remedy which promises relief without so much discomfort on his part. These remedies should be carefully investigated by unbiased observers and the reports published. Studzinski[2] gives his results in 3 cases treated with "*Essentia antimellini composita.*" This is a patented mixture, the active agent in which is said to be jambul. All of Studzinski's patients were young and all had idiopathic diabetes. Careful trial of the compound failed to reveal any change that could be attributed to the use of the medicine. The treatment is very expensive. Lenne[3] also calls attention to bad results obtained with this compound.

Dapper[4] has described the results in 4 cases of diabetes mellitus treated with a patented preparation called "Djoeat." This, too, claims jambul as its active constituent, combined with numerous other drugs. The directions as given on the remedy insist upon the carrying out of a rigid diet. Dapper tried first the effects of diet alone and then gave the "Djoeat" to see if any additional effect was produced. In all four cases the result was unfavorable and in some instances the compound seemed rather to increase the sugar and acetone excretion. When *jambul* is used Dapper recommends the formula of von Noorden. He advises that the drug be bought of Merck in order to ensure its freshness, as old material is inactive. Two hundred grams of the fruit are finely chopped and to it is added 10 gm. sodium chloride, 4 gm. salicylic acid, and 2 litres of water. The mixture is allowed to macerate for twenty-four

[1] Deut. med. Woch., 1904, Nos. 45, 46, and 47.
[2] Ibid., Nos. 24–25.
[3] Therapeut. Monatsheft., October, 1903.
[4] Deut. med. Woch., 1904, No. 32.

hours at blood temperature. The dose is 100 c.c. morning and night.

Among other drugs mentioned are *potassium iodide*, which is warmly advocated by Galloway.[1] He gives the salt in doses of 10 to 15 grains every three or four hours until the specific gravity of the urine becomes normal and the sugar disappears. The treatment is then omitted until the sugar reappears, when the iodide is again given in smaller doses. This treatment is kept up at intervals until the glycosuria has permanently disappeared. Iodism does not appear until the sugar has disappeared from the urine. The value of this treatment as a routine is very problematical. Williamson[2] again insists upon the value of *aspirin* and *sodium salicylate* in the treatment of diabetes. The former is given in powder form beginning with 10 grains twice daily and increasing to 15 grains four or five times per day. The sodium salicylate is given in peppermint-water, and from a small dose increased to 15 grains three to five times daily. Opium and its preparations, *jambul*, *uranium nitrate*, *arsenic*, and *antipyrin*, are useful in some cases. The opium has the disadvantage of causing constipation and in severe cases appears to predispose to coma. Thomson[3] states that the treatment depends upon the age of the patient; the condition of nutrition, which is indicated by the urea output, an excess of this indicating waste; the presence or absence of obesity which necessitates special medication on account of the heart. Thomson believes that drugs like opium have only a symptomatic action and that permanent change cannot be expected from their administration. He is enthusiastic in regard to the use of *cod-liver oil*, especially in young people. The younger the patient the more it is to be urged. The dose should be increased as much as possible. Believing that diabetes is a muscle disease he advocates the use of iron because of its oxygen-carrying property, and places it next in value to cod-liver oil. In order to prevent the constipation so often attendant upon the administration of iron Thomson gives it in the form of *Hooper's pills*, the formula of which is: sulphate of iron, 30 grains; powdered senna, powdered jalap, cream of tartar, powdered ginger, each grs. xij; ext. gentian, q. s. M.—Div. in pil. xxx. In addition to these remedies he speaks in favor of a class of drugs which he terms antiseptics, including the phenol derivatives, salicylates and benzoates. He places quinine and arsenic in this class.

Oefele,[4] believing the pancreas to be at fault in a larger number of cases, directs his treatment to this organ. For the involvement of the pancreas speaks the insufficient intestinal digestion, as well as local manifestations, such as dull pain in the left hypochondrium, reflex

[1] Medical Record, April 16, 1904.
[2] Loc. cit. [3] Loc. cit. [4] Loc. cit.

paræsthesia in the extensor muscles of the left shoulder and in the left ischiadicus, tenderness in the eleventh and twelfth intercostal spaces, and especially a girdle of dilated cutaneous vessels visible to the outer side of the mammary line in the hight of the left diaphragm. Local applications of iodine as well as massage, which increases the circulation of the blood in the abdomen and leads to the emptying of the pancreas, are indicated. Examination of the feces should be made in all cases of diabetes, and intestinal decomposition and marked acid reaction be treated. Deficient digestion of muscle tissue is aided by *pankreon*, and that of neutral fat by sapomedicatus (0.2 gm. in pills thirty minutes after eating). Barkan[1] has reported good results, in a man aged fifty-eight years, from *exercise* of a rather severe character, such as wood-chopping, brisk walking of eight to ten miles daily, etc.

In regard to the treatment of *coma* most authors are in accord. The accepted medication consists chiefly in milk diet and the administration of *sodium bicarbonate* by mouth, enema, or intravenously. Krause[2] mentions a symptom of diabetic coma hitherto unobserved. This consists in a high grade hypertonus of both eye-bulbs which Krause noted in 3 cases of diabetic coma about fifteen to thirty-two hours before death. In 4 cases of coma from other causes this symptom was not present, consequently it may be of value in differential diagnosis. No explanation of the phenomenon could be given. The administration of acetone, phloridzin, and beta-oxybutyric acids to dogs and rabbits in large quantities produced no positive results. A dog dying from diabetes after extirpation of the pancreas did not show the symptom nor was it possible to produce it by marked diminution of the blood pressure or by removal of water from the organism. The anatomical examination of these bulbs showed a normal condition.

DIABETES INSIPIDUS.

The occurrence of diabetes insipidus is rare and the report of several cases during the past year is of interest in reminding the practitioner of the necessity of careful observation, as the disease may be readily overlooked. The two chief symptoms are polyuria and excessive thirst, and these may be present for many years without any failure in health. Futcher[3] divides the condition into idiopathic and symptomatic. In the first class are included those cases in which no organic change can be found to which the polyuria might be attributed. Symptomatic diabetes

[1] Medical Record, June 11, 1904.
[2] Centralbl. f. innere Med., 1904, No. 20 (Society Report).
[3] American Medicine, May 28, 1904 (Society Report).

is most usually traced to some lesion of the central nervous system, the most common being tumors of the floor of the fourth ventricle and of the medulla, basilar meningitis, and cerebral hemorrhage. Futcher thinks that cerebral syphilis is the cause of more cases than has hitherto been believed. Especially frequent is a syphilitic basilar meningitis. The occurrence of a transitory bitemporal hemianopsia in a case of diabetes insipidus is strongly indicative of its syphilitic character. In fifteen years only 7 cases of the disease have been met with in the Johns Hopkins Hospital and Dispensary, and of these 5 were symptomatic, and four of these undoubtedly syphilitic. In the majority of cases thirst was the first symptom complained of. Stein[1] discusses a case in which no organic cause could be determined clinically, and he expresses some doubt as to the condition being so frequently symptomatic. Grober[2] describes a case of diabetes insipidus in which there were marked symptoms of cerebral tumor. The patient was a man of probably thirty years of age, who had always been healthy and whose family history was good. He was married, and had two healthy children. In the spring of 1902 he was thrown from a bicycle and struck on his head. From that time on he suffered from frequent headache, but continued at work. In October of the same year he had an attack of typhoid fever lasting six weeks. Two weeks after beginning his work again he was suddenly seized with a headache on the left side, and the left eye began to swell, and he could not move it. He consulted an eye clinic, and was around for some days, when he became semicomatose and was placed in bed. There was no fever and the pulse was slow, 45 to 50. He had pain in left side of head, also in the neck and the first cervical vertebræ, which was increased by pressure and motion. There was paralysis of the vasomotor, and probably the abducens, and a paresis of the left facial as well. The knee-jerks were absent; there was no ankle clonus and no Babinski phenomenon. The urine examination on December 18th showed a specific gravity of 1030, while the amount for twenty-four hours was only 200 c.c. Daily examination showed a gradual increase in the amount passed with a corresponding decrease in the specific gravity until January 2d. The twenty-four-hour quantity was 9600 c.c., and the specific gravity 1005. Later on the mental condition improved and the patient was again able to work. After carefully discussing all sides of the case, Grober is of the opinion that the trauma was causal, although he admits that the typhoid fever may have been at fault, as cases occurring after typhoid have been reported.

As already stated, the two chief symptoms are polyuria and thirst. Text-books fail to mention any special complications except the dryness

[1] Münch. med. Woch., 1904, No. 36.

[2] Ibid., 1904, No. 37.

of the skin. Recently, Brayton[1] calls special attention to the cutaneous manifestations in diabetes insipidus. Besides the harshness of the skin, these patients all had a more or less intense pruritus which was especially troublesome at night. In one of the patients there was a history of several attacks of alopecia areata which cleared up. In all the patients Brayton noted a rapid pulse, about 90.

The Treatment of Diabetes Insipidus is, as a rule, most unsatisfactory. Futcher advocates an antisyphilitic treatment on the ground of the frequent history of syphilis. In discussion of Futcher's article Tyson stated that potassium iodide had given good results. Stein[2] tried a large number of remedies on his patients without effect until he began the use of strychnia nitrate subcutaneously in ascending doses. The effect was prompt and immediate, and the output of urine was reduced from 18 litres to 4.5 to 5 daily. There was gain in the weight and general condition of health. Feilchenfeld[3] had already reported a great diminution in the urinary output in 2 cases of diabetes insipidus under treatment with injections of strychnia nitrate. There was, however, no increase in the specific gravity. He believes the drug to act directly on the nervous system. Wolff[4] used ergot in 2 patients with diabetes insipidus. One of them showed marked improvement. The quantity of urine diminished from 11,000 to 2000 c.c., and the patient gained in weight and strength. The result in the second instance was less marked. The thirst disappeared after the first dose. Wolff thinks the drug acts by contraction of the bloodvessels, thus lessening the quantity of blood which passes through the kidneys. He believes the primary cause of the disease to be a functional change in the renal epithelium. Finally, Dr. Hawke, Chief Resident of the Insane Department of the Philadelphia Hospital, mentions 3 cases of diabetes insipidus in which benefit was obtained by the administration of chloride of gold. The great number of drugs advocated is easily understood from the multiplicity of causes which lie at the basis of the disease. The good effect of antisyphilitic remedies is not so clear. In certain of the cases reported above there is a statement that the effect was almost immediate, and the question naturally arises as to how much suggestion had to do with the result. The occurrence of polyuria as a manifestation of hysteria is well known, and the difficulty of differentiating an hysterical polyuria from diabetes insipidus is a real one. Our knowledge of the metabolic changes in diabetes insipidus is too limited to permit of conclusions, but at present it would be better to withhold judgment as to cases which are apparently idiopathic.

[1] Journal of the American Medical Association, August 6, 1904.
[2] Loc. cit.
[3] Deut. med. Woch., 1903, No. 31.
[4] Münch. med. Woch., June 9, 1903.

MYXŒDEMA.

Lack of space in last year's review prevented a discussion of this subject. By far the most pretentious article is that of Magnus-Levy,[1] who bases his publication upon 34 cases personally observed. He classifies the various forms of the disease under four headings—adult myxœdema, cachexia strumipriva, sporadic cretinism, endemic cretinism.

Adult Myxœdema. In the history of the patients some acute infectious disease, as erysipelas, and especially influenza, was given as the causal factor. This apparently only served to stir the disease into activity, and it had probably existed in mild grade some time before. In 2 cases there was apparently a mild Basedow's disease preceding. The family tendency was apparent in 2 cases. In one a severe case developed in a short time after a severe abortion in which there was no septic infection. Tuberculous family history was obtained only once. The disease began before the twentieth year in 3 cases, about the thirtieth year in 2 cases, and in the other cases between thirty and fifty.

Symptomatology. The swelling of the skin is not usually general, and affects especially the head and face; occasionally other portions of the body, particularly the extensor side of the extremities. Marked tumor formation of the skin is infrequent. There was usually absence of sweat formation, and almost always a sensation of cold. The mucous membranes were generally swollen; changes in the hair were practically always present. The nails and teeth, as a rule, showed no change.

Thyroid Gland. In 5 cases is was distinctly enlarged but hard. In 1 case a slight remnant was found; in 5 other cases no thyroid was demonstrable. The heart was often enlarged, with murmurs present. Albuminuria was certainly present in 2 cases only. Sugar was absent except in 1 case, and then it was transitory.

Sexual Functions. These showed no striking change, though the menses were irregular and scanty in many cases.

Menorrhagia and other hemorrhages were absent in all his women patients. In the one man patient there was apparently complete impotency. The body warmth was diminished and the weight increased, the appetite lessened, the bowel movements constipated.

Nervous System. Motor disturbances were present in 2 cases in the form of tremors. In one of these the patient was hysterical, and in the other the tremor was probably the remainder of a preceding Basedow's disease. The peculiar waddling, "hippopotamus-like" gait the author does not believe to be dependent on nervous or muscular change. Difficulty in speech and monotony of speech, as well as hoarseness of the

[1] Zeit. f. klin. Med., 1904, vol. lii., Heft 3 and 4.

voice, appeared early. Disturbance of sensation with the inception of a subjective sensation of cold were not noted.

CEREBRATION AND INTELLIGENCE. Marked degeneration he found in only one patient, and does not think it is as frequent as the books usually describe it. There was usually a diminution in cerebration. There was apathy, depression of spirits, tendency to weeping, and rarely abnormal irritability; but even in severe cases intelligence may be entirely normal.

Cachexia Strumipriva. Only one patient whose condition of myxœdema could be attributed to operative removal of the thyroid gland is included in this series. This condition is now so infrequent that a brief résumé of the case is given. The patient was a boy of a healthy family who, on account of the danger of suffocation from an enlarged thyroid, was operated on in 1883 and the entire gland removed. He was then in his fifteenth year. The myxœdematous change soon began. In 1886 he was demonstrated as a case of cachexia strumipriva. From the time of his operation in 1883 up to 1896 he grew only 6 cm. in height, and the remaining development showed the same lack of growth. At this time, though twenty-eight years of age, he presented in size, sexual development, and general appearance the characteristics of a boy of fifteen years. It is to be emphasized that in this very severe example of athyroidism there was no especial mental deterioration, although there was a quantitative diminution in mental facility. The skin on the head, face, hands, and feet was quite markedly thickened, and to a less extent showed the same change with the rest of the body. The patient was rather thin. The examination of the blood showed a slight anæmia. The *x*-ray showed a distinct separation of most of the epiphyses.

Sporadic Cretinism. There were 9 of these cases in the series, 7 of whom were males and 2 females, which differs somewhat from the usual idea that the female sex is more prone to the condition. It is probable that sex makes but little difference. Four of the cases were severe and 5 were of the mild type. One of these cases is of special interest in showing a transition from the mild to the severe form of the disease. This patient from early youth showed evidences of thyroid insufficiency in his lack of normal growth, sexual development, and the presence of the cretin habitus. He showed a tendency to obesity. The condition of the skin in early life was uncertain. His intelligence and general psychical behavior were completely normal, and he was able to support himself as a writer in an office. In his thirty-first year, after a post-operative facial erysipelas, marked degeneration evinced itself, and he showed a picture of adult myxœdema arising in an otherwise healthy man. This case also points out the very distinct connection between sporadic cretinism and adult myxœdema.

Of the 5 mild cases 3 were in children. There was no marked disturbance of the intelligence, and the bodily manifestations dominated the picture. These children could scarcely be called cretinous in the ordinary sense of the word, and come well under the term formerly employed (myxœdema of children), which was supposed to be distinct from the true sporadic cretinism. Magnus-Levy does not believe that this distinction is justified, and he is inclined to the belief that these various types present simply varying grades, running from severe to mild, all of which can be best described under the name of hypothyroidisms. He has no doubt that the lighter grades would eventually become severe if not treated.

In studying the etiology Magnus-Levy notes that the majority of the cases developed in early life, at which time they presented but few signs of a diseased condition. The families of the patients were all healthy, and there was usually a large number of children in the family. The patients might be either the first or the last child of the family, or even might be one of the intermediate children. Taking into consideration the healthfulness of the families and the early age at which the disease manifested itself, the possibility of the disturbance in embryonal life must be thought of, and the disease attributed in many cases to maternal disturbances during pregnancy. In the severe cases a complete aplasia of the thyroid must be assumed, which is perhaps of mechanical origin.

Hertoghe has called attention to disturbances of the maternal organism during pregnancy as a cause of the milder cases, but the proof of this is very difficult to obtain. Severe disturbances in pregnancy could not be obtained in the cases of Magnus-Levy. In 2 cases a distinct history of increase in the severity of the disease after an infection was given. In the symptomatology of the disease it is noted that the stature is always diminished, and there is a corresponding diminution in weight; and sexual development is entirely null in the severe cases and tardy in the lighter ones. The changes in the skin are much like those found in adult myxœdema. The tumor-like formations around the chin and over the clavicles are much more frequent in the cretin. The specific facial expression is caused by a retraction of the root of the nose, as well as by the condition of the skin. This may be absent in severe cases and present in the mild ones. The hair is usually rough, but not always thin. The growth of the hair on the body is either absent or very slight. Disturbances in the condition of the teeth and nails are more frequent than in adult myxœdema. The mucous membranes are markedly thickened in the severe cases and less so in the milder ones. The thyroid gland was undemonstrable in practically all of the cases. In one patient there was originally a goitre which had been removed, with the exception of a small portion, but the gradual formation

of this goitre as well as its removal were without influence on the general condition.

The internal organs showed little change; after long-continued cases albuminuria was occasionally found. Examination in 3 cases showed an approximately normal condition, except in 1 of very severe disease, in which there was well-marked anæmia. The remaining cases showed no clinical evidences of blood deterioration.

Temperature in the severe cases was continually low; the pulse was normal. Constipation was almost always present. A pendulous abdomen and waddling gait were well marked in the severe cases and less so in the mild ones. Disturbances of motion and sensation, with the exception of monotonous speech and the subjective feeling of cold, were not observed. The intelligence was of all grades from imbecility to normal. That the intelligence and mentality, even in cases with well-marked bodily symptoms, need not necessarily be influenced was shown by Virchow, and with this opinion Magnus-Levy is in accord.

Endemic Cretinism. There are 14 cases in the series of Magnus-Levy occurring in seven families. In four of these families several members were affected; in three only one, but in these three several members had goitre. Of the cases 8 were severe, 5 mild; 1 is treated of separately. From the statement of the people it would appear that the condition was more frequent in that region than previously. No connection between the disease and the water supply could be demonstrated. Most of these patients showed their first signs of disease during the first decade; only one developed after the tenth year, becoming distinctly affected after an attack of whooping-cough. In the symptomatology Magnus-Levy differs somewhat from Ewald and Bircher, who have taught that the myxœdematous change of the skin does not occur in endemic cretinism.

Magnus-Levy found in the lighter grades no distinct changes were evident in the skin of the body, but in all cases skin changes were noticeable at least on the head. In the more severe cases the typical skin changes were present over the entire body. The tumor formations on the neck and body were much more frequent. The mucous membrane in most of the cases was thickened like the skin. The hair was rough, and the nails and teeth were somewhat changed. The hands were moderately well formed. The thyroid was not demonstrable in a large number of the cases. One showed a small goitre. This is much in opposition to the usually expressed views in regard to the presence of goitres in cretins. The heart showed a slight enlargement; urine and blood examinations were not made. All the children showed a diminished stature, and in the severe cases lordosis, pendulous abdomen, and constipation were present. The intelligence was of all degrees, but

there was no case of complete imbecility. The psychical attitude, with the exception of one case, was rather cheerful and friendly. One patient is of especial interest. The skin symptoms were very slightly marked, the height was distinctly but not markedly below the normal. The lack of intelligence was probably due in part to extreme deafness which was probably congenital. Cases of deafness with varying disturbances of intelligence, but without well-marked symptoms of body degeneration, are frequently met in the same regions with endemic cretinism. The connection between this degeneration and that produced by thyroid insufficiency is not very clearly defined. The frequency of the occurrence, however, would speak for a close connection.

Along with the clinical descriptions of the patients Magnus-Levy presents a series of investigations upon the respiratory interchange of gases in the myxœdematous condition before and after thyroid medication. He points out as factors to be considered in these studies the fact that in children the respiratory interchange is higher than in adults, and as cretins present the same condition as in a child, we must compare the results with those in a child of the same age. In practically all cases where the myxœdematous condition was marked a lowering of the respiratory interchange was evident; the degree of this diminution being in proportion to the severity of the symptoms. He concludes that "the low level of the gaseous interchange in severe cases of myxœdema is not produced through the lessening of the amount functionating protoplasm, but by a diminution in the life energy of the protoplasm. All severe cases of myxœdema show a marked diminution in the gaseous interchange to about 50 per cent. to 60 per cent. of that found in the healthy individual." Under the influence of thyroid medication there is a prompt increase in the gaseous interchange, beginning within a week after the commencement of the treatment, and increasing gradually to the fourth or fifth week. The amount of this increase is often very great, reaching as high as 50 to 70 per cent. more than the original worth. In the milder cases the increase in the gaseous interchange is only slight, not more than 20 per cent.—an amount of increase that may be brought about in non-myxœdematous patients by thyroid medication. These findings are not in accord with those of Kishi,[1] who found that metabolism was increased in animals after thyroidectomy.

The Treatment of Myxœdema and the allied conditions is the rational sequence to the belief that they are due to absence of thyroid action or secretion, and consists in the replacement of the deficient gland by administration of thyroids of animals. Magnus-Levy[2] discusses this fully on a basis of the 34 cases previously mentioned. It is of interest that

[1] Virchow's Archiv, 1904, Bd. clxxvi.

[2] Therapie der Gegenwart, February and March, 1904.

his results in endemic cretinism were fully as good as in other forms of myxœdema, which is contrary to the experience of other writers. In classical cases a treatment of four to eight weeks' duration often leads to complete cure. The first signs of return to health are generally an increased feeling of warmth, and a beginning of the formation of sweat on the skin. The dulness and apathy diminish quickly, and the appetite and consumption of food become better, and the bowels less constipated and more regular. Movement and speech become more lively and spontaneous. Along with this there occurs (in the beginning associated with increased urination) marked decrease in weight; the skin becomes thin and supple, the gray and scanty hair appears in all its former freshness, and even takes on a new and darker color. In some cases, however, the administration of the organic extract must be continued over a long period of time. In many cases the treatment is not well borne, but it is very difficult to recognize these without a trial. These cases are usually those associated with marked weakness of the heart, and it may require years of treatment, directed to the heart and the bettering of the general condition, before a long trial is cautiously made with thyroid extract. In these cases small doses (½ to 2 tablets) over periods of four or six weeks, with frequent and long intermissions, and with great watchfulness, are necessary.

The disagreeable accidents resulting in consequence of hyperthyroidosis consist in an abnormal feeling of heat, and a burning skin, irritability, hallucinations, sleeplessness, diarrhœa, loss of appetite, and, above all, in symptoms of subjective and objective heart weakness, with tendency to fainting. In children there develops, in consequence of their excessive and rapid growth, frequently a scoliosis or a kyphoscolicsis, consequently long pauses are necessary. When, by the usual beginning doses of one tablet in adults and one-half of a tablet in large children and one-quarter in children under three years, there are no unpleasant accompanying symptoms, the dose should be increased threefold every two or three weeks. Where a daily visit is impossible a smaller beginning dose is advised. To prevent recurrence after cure has been obtained it is necessary to continue the use of the drug; one tablet or even less is sufficient. An interruption of four to five weeks two or three times yearly is often useful to increase the reaction of the extract.

Magnus-Lævy tried the various preparations of thyroid substance with a view to determining the most active. Comparisons were made with the ordinary tablets of thyroid extract (an extract of the entire gland), "thyroidin," "thyreoglobulin," and "thyreoantitoxin." As far as could be observed the results were practically the same with all varieties, and as the first one is the cheapest, and the last three have no

claim to being unattended by disagreeable symptoms, the ordinary thyroid tablet is to be preferred.

From time to time attempts have been made to treat the condition by thyroid grafts. Christiani[1] claims uniformly successful results by following these rules:. 1. The graft must be homothyroid. 2. Only normal living tissue may be transplanted. 3. Small multiple grafts must be made, taking care to implant them in very vascular regions.

Myxœdema and Diabetes. The occurrence of myxœdema in combination with diabetes mellitus is very unusual, and the cases reported by Gordon[2] are of interest. The first case was a child of three years, seen first January, 1903, with a history of illness for the preceding six months. During this time the child developed great thirst, polyuria, polyphagia, gradually increasing mental dulness, and extreme pallor of the skin. On examination the skin was seen to be of a waxy yellow color, slightly œdematous, and very dry. The eyelids were also puffy, but there was no pitting. The father stated that there had been a gradual increase in the size of the face, hands, feet, and abdomen, and that the whole body was puffy and larger than formerly. The mental condition was dull, and the child seemed to be entirely indifferent to his surroundings, and answered either not at all or very slowly. The blood showed 2,750,000 red cells; 14,000 white cells; 50 per cent. of hæmoglobin. The differential count was normal. The urine had a specific gravity of 1038, and showed the presence of glucose. A quantitative estimation of the latter was not made.

The second case, a brother of the first patient, was four and a half years old and showed the same physical characteristics as the first case, but to a more marked degree. The mental symptoms consisted of apathy with occasional outbreaks of excitement. The family history is interesting. One grandfather had had several attacks of delirium tremens; one grandmother suffered from gout and migraine; the father is a neurasthenic, and the mother was obese and had been treated for diabetes.

Both patients were put upon small doses of thyroid extract, and by the end of the first week there was a marked diminution in the thirst, polyuria, and sugar output. At the same time there was distinct improvement in the mental condition. The effect was first noted on the diabetic symptoms, and later on the myxœdema. At the end of four months all traces of the glycosuria had disappeared, and the children were apparently normal. At this time evidences of hyperthyroidism manifested themselves and the thyroid substance was omitted. After three weeks mental hebetude and glycosuria again appeared, and the

[1] Medical Press and Circular, August 17, 1904.
[2] American Medicine, February 6, 1904.

thyroid was resumed in gradually increasing doses, without trying to approach the maximum dose. The younger child was given 1 grain and the older child 2 grains of the thyroid extract daily for a period of two months, since which time it has been omitted but without recurrence of the symptoms.

A somewhat similar case has been reported by Strasser[1] in a child of eight years. This patient presented well-marked evidences of cretinism and gave a history of having undergone a course of treatment with thyroid extract during the previous year with considerable benefit. He was first seen July 7, 1902, and at that time was again placed upon thyroid extract, and under this showed distinct improvement; no urinalysis was made. In September of the same year he was again seen, and the mother stated that within the preceding two weeks he had developed constant, violent thirst, was nervously hungry, and was almost constantly micturating. The attack was said to have succeeded overindulgence in grapes and ripe fruit of other kinds. A urinalysis now made showed 10 per cent. of sugar which a few days later increased to 15 per cent., and 4 litres of urine were passed in twenty-four hours. Thinking that the thyroid medication might be at fault, this was stopped and he was placed on restricted diet. Under this he failed in weight and the carbohydrates had to be increased. A month later there was still 8 per cent. of sugar, and the myxœdematous condition seemed to be returning. He was again placed upon thyroid extract, but this was continued for only a short time. Later on he again began to improve both mentally and as far as the myxœdematous condition was concerned, but the diabetes progressed, the sugar remaining constantly at 5 per cent. or above. He died in coma February 8, 1904. No autopsy was obtained.

Both the above authors comment upon the infrequency of the combination of diabetes mellitus and myxœdema. But when we realize the relative infrequency of either condition in children the rarity of the combination is not surprising. The concomitance of two conditions the nature of which is so undecided naturally leads to speculation as to a possible causal relation between the two. Gordon, pointing to the recognized fact that adrenal substance administered in certain ways is able to cause glycosuria, suggests that it is possible that another deficient or defective internal secretion may have the same effect. He quotes Herter's experiments, which go to show that the adrenalin acts on the pancreas, and thinks it possible that the altered thyroid secretion may act in the same way. Gordon believes that, whether the thyroid disorder acts directly in producing the diabetes or indirectly by influencing the pancreas, his cases and their response to thyroid medication show

[1] Journal of the American Medical Association, March 11, 1904.

a relationship between the two conditions. Strasser also speculates as to the causal connection, but from another standpoint. Inasmuch as the symptoms peculiar to the myxœdema improved with the progress of the diabetes, he suggests the possibility of the diabetes acting as a means of elimination of the mucin material deposited in the skin as a result of deficient thyroid action. In the light of our present knowledge theorizing is natural, but proof of the various theories offered is wanting.

Disorders of the thyroid associated with glycosuria are not uncommon, especially in exophthalmic goitre, but here we have to do with a hypersecretion. The production of glycosuria in obesity after thyroid feeding is well known, but in conditions of lessened thyroid action the occurrence of sugar is very rare. When one considers the very large number of circumstances which may produce glycosuria it seems to be the wiser plan to accept new theories slowly, and only upon very strong proof.

ADDISON'S DISEASE.

While little that is new has been added to our knowledge of this disease, cases are reported from time to time, though the number of these is not large when we consider the prevalence of tuberculosis. A case reported by Russell[1] shows the usual course of the disease as it comes to autopsy.

The patient was a man, aged sixty-five years, with a good family history. In October, 1896, the left testicle was removed for tuberculosis. In February, 1897, the right testicle became atrophied. In May of the same year he began to complain of pain over the cartilage of the seventh left rib near the sternum. In September a small abscess was evacuated. No caries of the rib could be detected. In February, 1898, an abscess again formed and a sequestrum of diseased bone was removed. In June, 1900, a portion of the eighth rib and cartilages was removed. A suppurating sinus remained. His general health improved somewhat after the operation and he was able to attend to his buisness. In October, 1901, a distinct pigmentation of the skin was noticed. Pigment was especially marked on the dorsum of the hands and over the face and neck. The sclerotics, scalp, and mucous membranes of the mouth were unaffected. The lips, however, showed a distinct line where they came together. Pigmentation was markedly shown on the outer sides of the arms, folds of the axilla and groin, and wherever there was friction or pressure. The patient complained of weakness and was unable to perform any mental or physical work. The heart action was feeble; he was short of breath; had palpitation, a tendency to

[1] British Medical Journal, January 31, 1903.

syncope, and coldness of the extremities. There was no noticeable emaciation. The appetite was variable and he had repeated attacks of indigestion, with vomiting and diarrhœa. He was given extract of suprarenal gland in increasing doses, beginning with the equivalent of 15 grams of the gland substance. The vomiting and diarrhœa were treated in the usual way. There was no improvement in the general symptoms, though a diminution of the pigment was noted. He died from asthenia on January 3, 1902. There was no coma or delirium. A limited autopsy failed to find the left suprarenal. It evidently had entirely atrophied. The right gland was enlarged and hard and completely degenerated. The whole medulla was found to have under gone tuberculous degeneration.

The Results of Organotherapy in Addison's Disease. Within the past ten or more years attempts have been made to treat Addison's disease by the replacement of the absent adrenals through the administration of the gland substance of animals. The brilliant results of thyroid therapy in myxœdema and cretinism very naturally led to the belief that loss of the adrenal function could be compensated for in a similar manner. Adams[1] has collected 105 cases in which organotherapy had been employed, and from these attempts to draw conclusions as to its value. His cases are arranged into four groups:

Class I. Cases in which alarming or fatal results were presumably or possibly due to the treatment.

Class II. Cases uninfluenced by, or deriving but doubtful benefit from, the organotherapy.

Class III. Cases in which marked improvement coincided with the treatment.

Class IV. Cases in which permanent benefit (cures ?) accrued apparently as a result of the suprarenal feeding.

All the cases included under Class IV. had been under observation for at least one year.

The methods employed to secure the action of the foreign gland substance were as follows: suprarenal grafts; fresh glands by the mouth; hypodermic or intramuscular injection; fluid or solid extract by the mouth; mixed methods (hypodermically and by the mouth). The glands were obtained from various animals, including the dog, rabbit, calf, pig, lamb, ox, and cow, and in many instances it was specified that the medulla of the gland had been used. In not a few cases it was expressly stated that the suprarenals were from young animals.

In the 7 cases included under Class I. there is good reason to believe that death resulted in consequence of the operation in the three instances

[1] The Practitioner, October, 1903.

in which suprarenal grafts were made. Sudden death was also recorded in 5 other cases of the series during the course of organotherapy, but it must be remembered that sudden death is a well-recognized mode of termination in Addison's disease, whether treated or untreated. Such cases have been reported by Anderson and by Bradbury, and 3 out of Osler's 12 cases died suddenly. Severe cardiac distress may arise from the use of suprarenal preparations in other cases as well as in Addison's disease, when thus treated. On the whole there is no evidence to show that serious risk is incurred in Addison's disease by the ordinary methods of organotherapy.

In Class II. (49 cases) no appreciable benefit was obtained. It is only fair to say that many of the cases included in this class were moribund when treatment was begun. On the other hand, this is the class in which cases are apt to go unreported just because of the failure to secure improvement.

Before attaching weight to the more or less successful results attained in Class III. (33 cases) and Class IV. (16 cases), certain well-known features of the disease must be recalled, particularly the occurrence of remissions during which the patient may recover health and strength to a marked degree. Then, again, the effects of rest, hygiene, and good food must be considered in the treatment of any disease, and especially when it is of a tuberculous nature. Finally, there is always the possibility that a mistake in diagnosis may have been made. Thus Lloyd Jones, in writing to Adams concerning the later history of a case previously reported by Jones, states that after being from under observation for some months the patient was again seen and in the second instance a diagnosis of *pernicious anæmia* was made, and from this disease the patient died. No mention is made of an autopsy. Hale White, in 1896, mentions a similar case which he first treated with suprarenal extract under the impression that the patient was suffering from Addison's disease, but later found the condition to be pernicious anæmia. Adams has also seen a case of this kind. While the difficulty in diagnosis is undoubted and it is naturally impossible that an autopsy be secured in every case, Adams thinks it improbable that very many of the cases reported as showing improvement were incorrectly diagnosed. As distinct proof of the value of suprarenal medication are cases 59, 70, 80, 82, 83, and 97 of the series, in which the gland substance was administered over a long period of time and in which cessation was always followed by a relapse. Thus Dieulafoy's case (70) relapsed twice when the adrenal substance was withdrawn and as promptly recovered when this was resumed. Anderodias' patient (80) when last heard of remained well in spite of hard work, but found it necessary to take some of the extract daily. Oliver's patient (82) has been taking adrenal pills for eight years.

These reports serve to show that in some cases at least organotherapy is of great and lasting value, and the question naturally arises, Is it possible to recognize the proper case for adrenal administration? Careful comparison of the histories of these reported cases fails to answer this question satisfactorily. The treatment has apparently been signally successful in some of the least promising cases, where it was used late in the disease, and upon patients who had complicating tuberculous lesions elsewhere. Even an extreme degree of asthenia has not always militated against a degree of success which has seemed quite extraordinary, as evidenced in case 59 of the series. On the other hand, it has as signally failed in the simple, uncomplicated disease taken quite early. These contradictions are as yet unreconciled. It would seem, according to Adams, that the cases most likely to derive benefit are those in which the tuberculous process is a chronic sclerosing one, and where the other organs are fairly sound.

The author's deductions are as follows:

1. There would appear to be a certain class of cases of Addison's disease which derives indubitable benefit from the exhibition of some form of suprarenal substance, though in any given case it remains up to now impossible to determine its probable response to the treatment.

2. In any given case of the disease, selected haphazard, the probability obtains that disappointment will follow on the institution of organotherapy; but that probability is very distinctly less than that attaching to any alternative method of treatment at present known.

3. The last word upon the preparation to be used and its method of administration remains yet to be said. The problem seems to be to get a sufficient and continuous dose of the pure and active principle unchanged into the blood stream. Intravenous injection is impracticable.

Any judgment of the value of adrenal therapy must take into consideration the pathological processes concerned in the disease. The article of Vecchi mentioned in PROGRESSIVE MEDICINE in 1902 seemed to make this very clear. From his experiments on animals this author came to the conclusion that typical Addison's disease was the sum of two factors—suprarenal insufficiency plus tuberculosis of the other organs that may be involved in the particular case. With this conception of the disease it is evident that the effect of any treatment directed against the suprarenal insufficiency will depend to a large extent upon the management of the general tuberculous condition, and differences in the latter may account for some of the discrepancies in the reported cases. In the light of our present knowledge of tuberculosis it would seem impossible to attain good results from any form of specific medication unless proper attention is given to improving the general nutrition by abundant food, fresh air, and the regulation of exercise, etc.

From Adams' statistics it would appear that the combination of the general with the specific treatment would be of great value.

Concerning the form in which the gland should be given and the dosage, Adams makes no statement. In his series none of the cases were treated with the newer adrenal preparations—"adrenalin" and "suprarenin." From personal experience with the former it would seem to be an uncertain and perhaps a dangerous remedy to use in Addison's disease, as there is no way at present of gauging its effects unless it be given intravenously. Given by the mouth in large doses no change was produced in pulse-rate or blood pressure. Given hypodermically in a dose of 15 minims in one case no effect was noted; the same amount in another patient caused breathlessness, increased rapidity of the heart, and faintness. The urine passed within six hours after this amount of adrenalin by injection gave a distinct reaction with Fehling's solution. Where the adrenalin was used intravenously, as in cases of surgical shock, no reducing substance was found in the urine passed later.

EXOPHTHALMIC GOITRE.

The literature of the past year has been rather unproductive on this subject. Two cases reported by von Voss[1] are worthy of note on account of the unusual features present.

The first case occurred in a girl, aged twenty-two years, who was admitted to the hospital February 18, 1902. For five months previous she had suffered from palpitation of the heart and weakness, after which enlargement of the thyroid was noted. Besides, she had sweating and occasional attacks of dizziness. For six months the menstruation had been scanty. In the preceding month there had been much excitability and occasional attacks of diarrhœa. There was no hereditary taint. Physical examination showed her to be of normal build and moderate nutrition. The thyroid was enlarged particularly on the right side; was moderately hard, and a distinct systolic bruit could be heard over it. The neck measured 35 cm. The heart was enlarged to the left and a loud systolic murmur was audible over both the aortic and pulmonary areas; there was also marked pulsation of the carotids. The signs of Moebius and Graefe were not well marked, though both eyes showed exophthalmos. The pupils were equal in size, not enlarged, and reacted normally; there was slight nystagmus, marked general tremor, and dermographia. The tendon reflexes of both upper and lower extremities were increased and the skin reflexes were very lively. Occasional cramps

[1] Deutsche med. Wochenschrift, August 13, 1903.

occurred in the calf muscles. The pulse when recumbent was 120, which increased to 160 on rising; tension was increased.

The patient improved gradually for two months under the administration of bromide and sodium phosphate with galvanism to the thyroid. She then suddenly grew worse. The pulse became more rapid, there was frequent vomiting, and she failed rapidly in weight. The condition grew desperate, resembling an acute intoxication. Bromide, strophanthus, and convallaria being without effect, she was given 450 c.c. of normal salt solution subcutaneously. Within half an hour the pulse improved and the patient, previously delirious, became clear mentally. Four hours later the temperature, which had hitherto been normal, became elevated. This gradually fell and improvement was continuous until she was sent to the country. Here she felt so well that she returned to her work as a housemaid. In November she was again admitted, complaining of increased size of the goitre, dizziness, palpitation, and diplopia. The physical examination was practically as before. In addition there was a more marked exophthalmos, especially on the right side. The right superior rectus was paralyzed and the right abducens paretic; the left inferior rectus was paralyzed and the left adducens paretic. On the right there was a slight facial palsy. The pupils were normal. During the next two months the palsies varied greatly, the motion at times being almost normal. She passed through an attack of acute articular rheumatism and was again discharged as improved, with directions not to resume her work as a servant. A later report says that the diplopia still persists to a moderate degree.

The second case, an unmarried woman aged thirty-four years, stated that ten years previous she had suffered from nervousness and headache and had had palpitation of the heart and restlessness. Two years previous she first noted weakness in the left hand and seven months previous had remarked a weakness and tremor in the left leg. The manifestations of weakness had varied greatly in intensity, but in the preceding five months had become more marked. At that time the menstruation ceased, but reappeared three months later, along with obstinate diarrhœa, which had weakened her to such a degree that she could scarcely walk.

Physical Examination. The patient was of medium size, poorly nourished, and anæmic. There was slight exophthalmos, more evident on the right side. There was insufficiency of convergence; Stellwag's and Graefe's signs absent. There was a small, rather hard goitre, with no bruit. On excitement there was a fleeting redness of the face and roseola psychica on the chest. The heart was enlarged to the left; pulse 124. The hands showed a fine tremor. The strength of the arm muscles was not very great. The station was equally good with the eyes open or closed. The gait was slow and, in consequence of the tremor of the left

leg, uncertain. When recumbent the movements of the legs were not ataxic, but the left leg trembled greatly. Weakness was demonstrable in the flexors of the thigh and leg and in the extensors of the feet (tibialis anticus, peronei), especially on the left side. Both the adductors and abductors of the left leg were weakened. The tendon reflexes were markedly increased and ankle clonus was present on both sides. Treatment was ineffectual and she was discharged unimproved.

On a second admission the general condition was seen to be somewhat better, but she now showed palsy of the eye muscles. The palsies were multiple and occurred on both sides, being most marked in the right superior rectus. Both eyeballs were prominent, but this prominence was not the cause of the palsy. Other etiological factors than the Basedow's disease could be definitely excluded.

Moebius in his monograph in the Nothnagel series has commented on the infrequency of palsy of the eye muscles in exophthalmic goitre, and in the later literature von Voss has been able to find only 3 cases similar to these just reported. The origin of such palsies is not clear. In Bristowe's case the autopsy was negative. Von Voss is of the opinion that the view of Moebius that the palsy is of nuclear origin is correct. Whether the change is vascular or the elective action of a poison remains undecided. The variation of the palsies in these cases is striking. The peculiar disturbance of motility in the second case the author thinks resembles the choreic tremor described by Kahler, only in this instance the extremities were affected instead of the head. There was no occasion to suspect sclerosis or hysteria.

A case of *palsy of the extraocular muscles* is reported by Posey,[1] who finds from a search of the literature that the condition is more common than is usually believed. He mentions the grouping of Buschan into (1) cases complaining of diplopia, the muscles at fault not being ascertained; (2) palsy of the rectus internus; (3) palsy of the rectus externus; (4) palsy of the rectus superior; (5) palsy of the trochlearis; (6) palsy of the levator palpebræ of both eyes. In Posey's case there was palsy of the left sixth nerve, of the portion of the left third nerve supplying the inferior oblique and the superior and inferior recti muscles. There is a tendency to refer these palsies to an involvement of the central nuclei, which would be a point in favor of the idea that exophthalmic goitre is of central origin. The exact site, however, of the palsies has not as yet been determined. Since the palsies are sometimes transient, and in case autopsied no pathological changes have been noted, Posey thinks it probable that the morbid process is only functional, consisting of an irritation of the centres by toxins generated by some perversion of the action of the thyroid.

[1] American Journal of the Medical Sciences, July, 1904.

Exophthalmic Goitre in Infancy. Barrett[1] has collected 42 cases of exophthalmic goitre in children below the age of fifteen, the youngest being a child of four and one-half years old. These figures show that the condition is uncommon in childhood, especially in the earlier years. The symptomatology does not differ much from that of the ordinary adult form, and the three cardinal symptoms of tachycardia, goitre, and exophthalmos exist, though the last is sometimes less marked than in adults, and may be unilateral. Tremor is uncommon in the child, but on the contrary chorea is very common. There is great irritability of character. The disease is apt to come on more rapidly in a child, sometimes appearing suddenly, or becoming apparent in the course of a few days, the cardiac phenomena being the first to attract attention.

In some cases goitre is present for a considerable time before the appearance of other symptoms. The writer records some instances in which tremor was the first symptom to appear; fatigue and headache usually set in early. The duration of the disease is not so long as in the adult. The writer quotes 3 curious cases, 1 in which exophthalmic goitre appeared suddenly and subsided in the course of seven days, while in the 2 other cases it lasted six weeks. Two to three years, he records, is the limit.

Acute Suppurative Thyroiditis. Roth[2] reports a primary case of this very rare condition. The patient was an Italian laborer aged forty years. He was admitted November 26, 1902. As far as could be learned (the patient spoke English badly) he was taken suddenly with a chill and high fever on November 23, 1902. He became gradually worse until time of admission. On admission his temperature was 103.2° F., pulse 128. He was cyanosed, sweating profusely, and seemed profoundly septic. A diffuse swelling was found around the anterior portion of his neck, extending from the suprasternal notch to the upper border of the cricoid cartilage. The most prominent portion of this swelling was reddened, but there was no fluctuation. The mass was tender and dilated veins could be seen around the shoulders. The breathing and swallowing and moving of the head were difficult. No other abnormality was found. An operation was immediately performed. The exposed thyroid was smooth and dark blue in color. The capsule was dull. The opening on the left side showed the presence of pus and areas of necrosis were also found in the gland. The operation was rapidly terminated on account of the desperate condition of the patient. Temperature rose until it reached 107°. The condition

[1] Journ. de méd. et de chir. prat., July 10, 1902.

[2] American Journal of the Medical Sciences, January, 1904.

became worse and in spite of all treatment the patient died on November 27, 1902. Post-mortem examination showed no abnormality except in the thyroid gland. Both lobes were enlarged and swollen, the right lobe to a greater degree. In the right lobe (?) there was an incised wound leading into a small irregular cavity. The microscopic examination showed leukocytic infiltration of the connective tissues, polynuclear leukocytes predominating. The colloid contents of the acini were obliterated by the cellular infiltration. In places there were areas of necrosis and abscesses. A pure culture of streptococci was obtained. The source of infection was undetermined. Rheumatism could be excluded. The author calls attention to the extreme severity of the constitutional symptoms, which might possibly be attributed to the interference with the thyroid secretion.

Treatment of Exophthalmic Goitre. The drugs and methods of treatment advocated in exophthalmic goitre are almost innumerable. Von Voss[1] speaks in favor of subcutaneous transfusions of normal salt solutions in bad cases, thinking that in this way the poison can be diluted or washed out. One of his cases showed very marked improvement after the injection of 450 c.c., but it is difficult to understand how so small a quantity could produce much effect. The same author warns against the use of iodine in ordinary goitre as well as in Graves' disease. He also says that very active drugs such as strophanthus and digitalis may act harmfully. Lanz[2] reports favorable results in 5 cases from the use of milk from thyroidectomized goats. (This method of treatment was fully discussed last year.) Moebius in the same journal speaks rather guardedly of antithyreoidin. The price of this preparation is so very high that it prohibits thorough investigation. Chaddock[3] reports 2 cases successfully treated by sodium salicylate, as suggested by J. Babinski. The salt was given in a dosage of 30 grains daily. In its administration care must be taken that the salt is a pure one in order to avoid irritation of the stomach, and the urine must be frequently examined. No explanation for its action is offered. Finally Roberts[4] reports 3 cases of exophthalmic goitre successfully treated by tabloids of didymin given in a daily dosage of 10 grains and gradually increasing to 20 grains daily.

When one considers the variety of remedies and remedial measures advised it is evident that in many of the cases the therapeutic treatment can hardly be looked upon as being the cause of the improvement that may occur. Cases of Graves' disease in the milder form, but with typical symptoms, are often seen which show distinct improvement

[1] Loc. cit.
[2] Münchener med. Wochenschrift, No. 4, 1903.
[3] Journal of the American Medical Association, April 18, 1903.
[4] British Medical Journal, June 2, 1903.

or even apparent cure on the simplest of medication, or even none at all, if the life of the patient is properly regulated.

Such patients if kept under observation for a long period of time are apt to show a recurrence of the symptoms if exposed to depressing influences. No rules can be given which can serve as a guide to the proper selection of treatment for the individual case.

SCURVY.

The report of cases which can be tabulated under the name of scurvy is of infrequent occurrence. Although no definite decision has been arrived at as to the nature of and cause of the disease, the diminution in the number of cases is proof that existing regulations have been of effect in stamping out the disease. There are two theories generally accepted as to causation. The first, and perhaps the most widely believed, considers the disease as due to a lack of some form of food necessary to the maintenance of the body functions, and as the disease has been most frequently seen in camps and on vessels, when the supply of fresh vegetables was limited, it has been held that an absence of this form of food tends to produce scurvy. The other theory holds that some form of microbic infection is causal, and the occurrence of the disease among a number of people at the same time and under similar circumstances lends some plausibility to this view. A recent article by Coplans[1] is of special interest because of circumstances which permitted unusually accurate observation. The cases of scurvy were met with in camps in South Africa, where, owing to the military regulations, the mode of life of all persons was much the same, and as the diet was furnished by the government a careful study of this was possible.

The symptoms presented by the patients were anæmia; spongy, bleeding gums; lassitude; breathlessness on exertion, followed later by lameness associated with synovitis and hemorrhages, and brawny, indurated swellings on one or both of the lower limbs. The blood showed marked poikilocytosis. Death resulted from cardiac failure, and on autopsy the heart muscle was found to be thin and pale, and the right side showed dilatation. There was an excess of fluid in the pericardial cavity. No nervous lesions were found. The urine presented no abnormalities. The disease first broke out at the camp at Middleberg and was thought to be due to the food. Both Europeans and natives were affected. A careful study of the conditions revealed the fact that the diseased individuals did not live up to the ordinary rules of personal cleanliness, and it was recalled that exactly the same kind and quantity of food was

[1] Lancet, June 18, 1904.

supplied to the camp at Standerton and Volkrust, where no scurvy was present at that time. It was noted, however, that the sanitary condition of these two camps was greatly superior to that existing at Middleberg. In this latter camp a new scale of rations was given and a plentiful supply of soap and fuel allowed, with the result that the scurvy disappeared. According to Coplans the improved cleanliness brought this about. Much later scurvy broke out in the Standerton district after troops had been concentrated in close proximity to the town. The disease continued and increased after soldiers and other classes were allowed to add to their diet by the purchase of fruit and vegetables. A special inquiry revealed the fact that those suffering from the disease were taking fresh vegetable food regularly. It was also found that the larger number of cases occurred in the native Sanitary Corps, 76 per cent. of whom were diseased. The only European affected was attached to this corps, but his food was entirely different from that of the natives. These natives were generally uncleanly in their habits, with the exception of the head native and his family of six, who lived by themselves and were unaffected through eating the same food as the rest. The European who was diseased was intimately associated with the natives, sleeping with them, though eating different food. In the Native Labor Corps only 16 per cent. were affected, this being attributed to their greater cleanliness, as they were taking the same food as the other natives. No case of scurvy was found among 150 natives employed as servants to the European camp staff, nor among the natives employed as domestic servants in the military messes, shops, and households. Of those admitted with scurvy to the hospital at Standerton, 12 per cent. died; 90 per cent. of those who recovered returned to their former duties, former dietaries, and former surroundings, and though living with men afflicted with scurvy no case of recurrence was reported. The author believes that these facts are opposed to the contention that the food was the sole cause of the disease. The infection appears to occur through the mouth, the whole system being involved secondarily and later. The manner in which the primary infection occurs, and how it gives rise to the manifestations of disease in the mouth, are points not easy to explain. He thinks the facts go to show that scurvy is not due to either the presence or absence of any particular kind of food from the dietary, but rather to an infection for which food may act as a vehicle under conditions of dirty storage or dirty preparation; and, considering that the disease prevailed in inverse proportion to the standard of personal hygiene of the individuals affected, its infectivity would seem to depend on the unsanitary habits and perhaps the unwholesome occupation of those who were its victims.

These observations of Coplans, backed up by careful investigation,

deserve consideration. The difficult part of the study of scurvy lies in the uncertainty of diagnosis in isolated cases.. Cases of hemorrhagic character occurring sporadically cause much trouble in classification. Two such instances are reported by Wagner.[1] The first occurred in a woman, aged forty years, who was admitted to the hospital April 19, 1904. The previous medical history was negative. She was employed as a domestic servant. Her illness began in February, 1904, with a feeling of weakness and lassitude, and a frequent "stitch" in the right side. The weakness increased and she had frequent diarrhœa. In April she saw a physician, who was unable to find evidences of any distinct disease. The condition growing still worse, a second physician was seen, who sent her to a hospital, where the first hemorrhages were noted in the lips and gums, and later on in the skin of the whole body. These spots gradually disappeared to be replaced by new ones. About this time she began to complain of dryness in the mouth and thirst. The breath became foul and there was increase in the saliva, which was of a fetid, mucous character. Still later there was fever, swelling of the submaxillary glands, sweats, and pains in the chest. When seen there were numerous bluish or reddish flecks over the body; hemorrhagic spots on the gums, palate, and mucous membranes of the mouth; temperature, 37.2 C.; marked *fetor ex ore*. The spleen and liver were not demonstrably enlarged. Active and passive movements of the joints caused pain, but nowhere were the joints swollen. At the site of a hypodermic injection there appeared a large swelling, and from the puncture a thin, bloody fluid exuded for a long time. The patient died two days after admission. No autopsy was obtained. A blood count made about one hour before death showed a leukocytosis of 75,000. A stained specimen showed the normal appearance of the red cells. The white cells varied greatly in size; all stained a light (hell) blue by the May-Grünwald stain; no distinct granulation noted in the cells. The large cells looked like large lymphocytes.

The second case was also in a servant girl, aged twenty-one years, whose previous history was negative except that she had had chlorosis at the age of seventeen, but this was of a light grade and required no treatment. She was admitted to the hospital April 28, 1904. Fourteen days before she noticed a pain in the gum, for which she consulted a dentist, who cauterized it. A short time later she noticed an unpleasant odor from the mouth and an increase of the gum inflammation in spite of care in cleansing the teeth and mouth. On April 25th she consulted a physician, who found only the signs of the former cauterization and a loose, carious tooth, which he extracted. The hemorrhage following

[1] Münch. med. Woch., Nos. 36 and 37, 1904.

the extraction was so great that she had to stay a considerable time in the physician's office. This physician, on making an examination, found numerous bluish flecks upon the body, and was told that these had been coming for some time. The hemorrhage from the tooth lasted two days. She was found to have some fever. The condition did not improve under the treatment, and she was sent to the hospital. According to the patient the bluish flecks had only appeared within the past eight days. There was a history of a possible abortion, but this was denied absolutely by the patient. The physical examination showed the patient to be well nourished. The hemorrhagic flecks were chiefly found on the extremities. The gums were spongy, and the site of the extracted tooth was gangrenous. The remaining organs were apparently normal. Liver and spleen were not palpable. The urine showed a little albumin and a few hyaline casts, besides numerous leukocytes and flat epithelial cells. Blood count, 3,150,000; leukocytes, 5000. On staining there was found slight poikilocytosis and slight increase of lymphocytes. Cultures from the blood were negative. With the progress of the disease the face became swollen, as did the submaxillary glands. Small hemorrhages appeared in the tongue. The general condition grew rapidly more grave, and death occurred on May 6th. Shortly before death a blood count showed a leukocytosis of 30,937. The autopsy showed marked hyperæmia and hyperplasia of the spleen; numerous ecchymoses in the skin, serous membranes, mucous membranes, especially of the stomach and intestines; effusion in pleuræ and pericardium; general pallor.

Both of these patients were servants, and living under conditions such as usually do not cause scurvy. The author calls special attention to the occurrence of fever as pointing to the fact that these cases could not be included under hemorrhagic purpura. His long discussion fails to bring out anything new, and likewise fails to prove that the cases reported were really scurvy. The history and the short duration all point rather to acute leukæmia. The blood examinations are so incomplete that much cannot be learned from them. It must be remembered, however, that leukæmia without a numerical increase in the leukocytes is of comparatively frequent occurrence, as has been pointed out by Kelly.[1] The cases above described resemble more nearly the case of hemorrhagic leukæmia reported by Wister and Gwyn[2] than the ordinary description of scurvy. They are given in detail to point out the varying conditions that may be reported under the head of scurvy. There is need for a revision of nomenclature in the so-called hemorrhagic diseases.

[1] Loc. cit. [2] University of Pennsylvania Medical Bulletin, April, 1904.

OPHTHALMOLOGY.

By EDWARD JACKSON, M.D.

DISEASES OF THE CONJUNCTIVA.

Bacterial Infections. The difficulty of discriminating between the diphtheria bacillus and the xerosis bacillus as found in the conjunctiva, and the confusion arising therefrom, have been spoken of in previous years. Heretofore nothing but inoculation experiments could be regarded as conclusive. A test now brought forward by Arnold Knapp[1] seems to furnish a readier and possibly more certain means of discrimination. He uses a fermentation test similar to that employed by Hiss to differentiate the pneumococcus. A 1 per cent. solution of each of the following sugars, dextrose, mannite, maltose, lactose, saccharose, and dextrine, is made in a medium composed of beef-serum 1 part, distilled water 3 parts. Finally some litmus is added.

It was found that the diphtheria bacillus caused the medium containing dextrine to become red and coagulate, while saccharose was unchanged. On the other hand, the xerosis bacillus produced fermentation with acid production in saccharose, while dextrine remained unaffected. The pseudodiphtheria bacillus of Hoffmann affected none of the sugars. The reactions required twenty-four to forty-eight hours. These results proved constant with 28 diphtheria, 10 xerosis, and 4 pseudodiphtheria series. Knapp reports one case in which the diphtheria reaction was shown, although the conjunctivitis from which the bacillus was obtained did not seem to jusify such a diagnosis. Inoculation of the guinea-pig, however, caused death in thirty hours, with the typical lesions of diphtheritic infection.

In discussing Knapp's paper, Randall and Woods reported cases of mild and chronic conjunctivitis, associated with the diphtheritic bacillus, which yielded only to antitoxin treatment. Stephenson[2] has reported a case of diphtheria of the conjunctiva, fatal through toxæmia, although no other mucous membranes were involved.

The presence of bacillus subtilis in the conjunctiva has generally been considered accidental, and not significant. Gourfein,[3] however, has

[1] Transactions of American Ophthalmological Society, 1904, p. 283.

[2] Ophthalmoscope, August, 1904.

[3] Transactions of the Tenth International Congress of Ophthalmology, Lucerne, September, 1904.

demonstrated the presence of this bacillus in 17 cases of acute conjunctivitis. The patients—men, women, and children—had been struck in the eye with earth. The disease affected both eyes in 11 cases. It lasted from six to eighteen days. There was nothing to distinguish it clinically from other forms of acute conjunctivitis. The cornea was slightly involved in 2 cases. In 5 cases the bacillus subtilis was found in pure culture. In the others it was associated with saprophytes, staphylococcus aureus, streptococci, and the pneumococcus. Experimentally, the bacillus caused conjunctivitis in rabbits when injected into the injured conjunctiva, and panophthalmitis when injected into the vitreous. Ulbrich[1] also produced a panophthalmitis by injecting a culture into the vitreous, and iritis by injections into the anterior chamber.

Influenza Bacillus and Trachoma. A case of severe pseudomembranous conjunctivitis in an infant is reported by A. Knapp,[2] in which the influenza bacillus and xerosis bacillus were found. Mueller[3] suggested that trachoma was due to a bacillus which zur Nedden identifies as the influenza bacillus. The latter, however, positively denies that this bacillus is the cause of trachoma. The cases in which he found it were not cases of trachoma, while in trachoma he found only accidental organisms.

A. Knapp,[4] in a bacteriological study of trachoma, encountered this bacillus in 8 out of 120 recent cases. It was not identical with the Koch-Weeks bacillus, but it could not be differentiated from the influenza bacillus in any way. Its presence in trachoma seemed accidental.

Phlyctenular Conjunctivitis. Ever since it was shown that most manifestations of "scrofula" were tuberculous in character, the relation of the tubercle bacillus with scrofulous ophthalmia has been a subject of especial interest. Bruns,[5] following a suggestion of Leber, has experimented on the rabbit by injecting dead tubercle bacilli into the external carotid artery.

In 33 experiments 7 animals died without eye lesions; in 10 the eye was lost through necrosis; in 6 the eyes remained normal; in 5 there was produced the clinical picture of phlyctenular conjunctivitis, and in 5 there occurred lesions of the uveal tract without any phlyctenules. The cases presenting phlyctenular lesions are described at length, with microscopic examinations of the lesions, which seem to have been quite similar to those of phlyctenular disease as seen in children. The chief differences observed were that the phlyctenules were smaller than in the human eye, did not go on to ulceration, and did not in any case involve the cornea.

[1] Graefe's Archiv f. Ophth., vol. lviii. No. 2, p. 243.
[2] Archives of Ophthalmology, July, 1904.
[3] PROGRESSIVE MEDICINE, June, 1904, p. 298.
[4] Archives of Ophthalmology, September, 1904, p. 463.
[5] Klin. Monatsbl. f. Augenh., January, 1904, p. 47.

Vernal Conjunctivitis. The dozen papers dealing with this subject that have appeared during the last year have added a little to our knowledge regarding it. Schieck[1] has found an abnormal development of elastic tissue underlying the conjunctiva, both in the lids and at the limbus. He makes this an important point in the pathologico-anatomical differential diagnosis of the affection. The degree of epithelial hypertrophy he finds more variable.

Johnston[2] finds the thickening of the epithelium more characteristic, although the increase of connective tissue is also prominent. He thinks the microscope establishes the fact that "vernal catarrh" is not a catarrh, but partakes of the nature of a new growth. Veasey[3] reports a case in which the growth resembled malignant disease of the limbus. This growth was removed in October, but recurred in May. Microscopic study of it then proved that the case was one of vernal conjunctivitis, and later similar patches appeared in the other eye.

My suggestion[4] that *Parinaud's conjunctivitis* and vernal conjunctivitis ought to be carefully studied for a possible connection with micro-organisms other than bacteria had already been acted on by Fortunati.[5] In excised pericorneal nodules he thought he discovered blastomycetic forms, and from cultures made from such nodules he isolated two varieties of blastomycetes—one round, the other oval. Inoculated upon lower animals both caused local lesions, without any influence on general health. Introduced into the human conjunctiva the round form provoked an irritation that quickly subsided. The oval variety caused nodules which recurred during the warm months, but without other characteristic symptoms of vernal conjunctivitis.

Remmen[6] reports as instances of this affection three cases that were quickly cured by the administration of moderate doses of sodium salicylate. But only one of the cases had been similarly affected in previous years.

Gallemaerts[7] has resorted to destruction of the conjunctival growths by electrolysis, used under general anæsthesia, with a current of 2 or 3 milliamperes. He secured decided amelioration of the symptoms, but not complete cure. In regard to the case of cure by *x*-ray applications reported last year,[8] Allport,[9] in a supplementary report says: This case is undoubt-

[1] Graefe's Archiv f. Ophthal., Bd. lviii. Heft 1, p. 1; Bd. lix. Heft 3, p. 553.
[2] Ophthalmic Record, April, 1904.
[3] American Journal of the Medical Sciences, May, 1904.
[4] American Medicine, November 12, 1904.
[5] Archivio di Ottalmologia, October, 1904.
[6] Ophthalmic Record, November, 1904.
[7] Polyclin. de Brusselles, February, 1904.
[8] PROGRESSIVE MEDICINE, June, 1904.
[9] Ophthalmic Record, December, 1904.

edly and permanently cured, having remained free from a single unpleasant symptom last summer without going to either mountains or seashore.

Parinaud's Conjunctivitis. This disease, heretofore scarcely mentioned outside of French and American literature, has attracted wider attention. Verhoeff and Derby[1] report a case which was carefully studied by the microscope and by culture methods, and they have collected 22 other cases, to which must be added cases reported by Stirling,[2] Matys,[3] and Salva.[4] Their bacteriological results, like those previously reached by others, were negative. The only organisms found were the xerosis bacillus and the white staphylococcus. Careful search revealed no fungi or protozoa. Tissue fragments inoculated in the anterior chamber of the rabbit and groin of the guinea-pig were absorbed without causing disturbance. The lesions consisted of marked cell necrosis, with extensive infiltration of the subconjunctival tissue with lymphoid and phagocytic epithelioid cells. The epithelium was at some points thinned, or even eroded. Of the 26 patients 15 were male, 11 female. Their occupations were too varied to give much support to the theory of animal infection. Their ages ranged from two to sixty-five years. In but 2 cases have both eyes been affected. The majority of the cases occurred in the autumn. All have arisen in the temperate zone.

The characteristic symptoms are the appearance upon the inner surface of the lid and in the fornix of large, reddish, semitransparent polypoid masses, with smaller yellowish granules between. Erosions are found, especially between the granules. Ulceration may occur, but is not characteristic. There is little if any conjunctival discharge. The lids are swollen, and the granulation masses may be felt through them, resembling chalazia. On the affected side there is swelling of the parotid region, and suppuration of the related lymphatic glands may occur. The patient suffers from fever, irregular chills, and sometimes loss of flesh. The disease ends in complete recovery, running its course in from three to twelve months.

It is noticeable that considerable series of cases have been reported by a few observers: Parinaud, 4; Gifford, 4; Sans, 3; Chaillous, 4. This might mean that the disease is more common than would appear from the literature, but has not been generally recognized; or it might mean that the disease is largely confined to certain localities. A more general search for it will probably decide which is the true explanation. It must be differentiated from tuberculosis by the absence of tubercle bacilli (which may only be revealed by inoculation) and the slight extent of the

[1] Archives of Ophthalmology, June, 1904.
[2] Ophthalmic Review, October, 1904.
[3] Zeitschr. f. Augenh., October, 1904.
[4] Le Dauphine Medicale, No. 3, 1904.

ulcerations. From trachoma it is distinguished by being usually confined to one eye, the large granulations, the parotid swelling, and the fever and other evidences of general sickness.

The most effective treatment appears to be the excision of the larger granulations. Stirling reports a remarkable amelioration of the ocular symptoms, following excision of the preauricular, submaxillary, and cervical glands. In Matys' case the ocular lesions followed severe inflammations of the nose and throat. Stirling, who found the xerosis bacillus in pure culture in the affected eye, but not in the fellow eye, tried diphtheria antitoxin without any marked beneficial affect. The ordinary antiseptic local applications of silver salts, mercurials, etc., seem to have little or no beneficial effect.

Purulent Conjunctivitis. Standish[1] compares the results obtained by the treatment of this disease with nitrate of silver and with the newer silver salts. Of 50 cases of *ophthalmia neonatorum* treated with silver nitrate, in which the cornea was clear when admitted to the hospital, 3 subsequently developed corneal ulcers which interfered with vision.

Of 50 cases treated with protargol, and 64 with argyrol, none developed corneal ulcer. Of 98 cases of *gonorrheal ophthalmia* in persons over five years of age, 48 were treated with protargol. Of these 32 were admitted with clear corneas, of whom 21 were discharged without corneal lesion. Of the 27 cases in which corneal lesions presented or developed, 4 eyes were lost. Of the 37 cases in which argyrol was used, 23 were admitted with clear corneas, and 16 discharged without corneal lesions. Of the 26 cases in which corneal lesions developed, 8 eyes were lost.

Standish points out that the best results were obtained with the 10 per cent. solution of protargol, and that with argyrol a 50 per cent. solution gave no better results than one of half that strength. He concludes that the newer silver salts are safer and produce better results than the nitrate, besides being more easily applied. That with ophthalmia neonatorum either protargol or argyrol is satisfactory; but in the gonorrheal ophthalmia of the adult, when the cornea has become involved, protargol seemed to afford better results. He regards the application of cold in these cases as a dangerous procedure that should be abandoned.

Conjunctivitis Nodosa. In reporting a case of this disease in an inmate of a colored orphans' asylum, de Schweinitz and Shumway[2] have attempted to fix the caterpillar, the hairs of which caused the condition. The case was regarded as probably one of tuberculosis of the conjunctiva until, upon microscopic examination of the excised tissue, the hairs of the caterpillar were found embedded in the nodules. Dr. de Schweinitz visited the place where the injury occurred, at the same season the next year,

[1] Journal of the American Medical Association, December 17, 1904.

[2] Transactions of the American Ophthalmological Society, 1904, p. 237.

and obtained three species of caterpillar. One of these, the spilosoma virginica, or yellow woolly bear caterpillar, the children were accustomed to throw at each other, and he believes this was the kind which caused the injury. Another form which he found, the empretia stimulea, or saddle back caterpillar, is known to be intensely irritating; but he found the children were aware of this, called it the nettle caterpillar, and never touched it.

Two cases of foreign body embedded in the conjunctiva for a period of six months, and giving rise in each case to a yellow inflammatory nodule, are reported by Wurdemann.[1] In one case the foreign body was a bee sting; in the other a jointed, hairy substance from a grasshopper.

Pemphigus of the Conjunctiva. In cases reported by Salva[2] and Brown[3] the conjunctival lesions seems to have been the first to arouse suspicion of the grave condition impending. These early conjunctival manifestations were of the nature of conjunctivitis, which improved promptly under ordinary treatment; but upon close examination there was found a loss of epithelium, and the inflammatory attack was followed by a permanent contraction of the conjunctival sac. The movements of the lids probably prevent the formation of blebs upon the conjunctiva, their place being taken by the recurring erosions. These cases illustrate the powerlessness of any treatment to control the malady. The patients, who were past middle age, had vision gradually reduced to faint light perception before the fatal termination was reached.

DISEASES OF THE CORNEA.

Suppurating Ulcer. A case of ulcer with hypopion is reported by McNab,[4] in which the bacillus pyocyaneus seemed to be the pathogenic organism. This bacillus has been found in several reported cases of purulent inflammation of different parts of the eye. In this particular case cultures were made from the ulcer and the hypopion that accompanied it. As the organism became less virulent the extension of the ulcer ceased, and it rapidly healed. In the treatment of the case the Saemisch section of the cornea proved an effective remedy. In previously reported cases, three of which are quoted in abstract by McNab, the eye was lost by panophthalmitis.

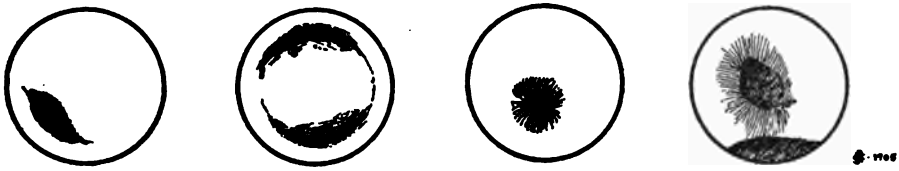
Kipp[5] adds to the observations recorded in his earlier communication.[6]

[1] Ophthalmic Record, February, 1905.
[2] La Clinique Ophtalmologique, July 25 and August 10, 1904
[3] Annals of Ophthalmology, July, 1904.
[4] Ophthalmic Review, March, 1904.
[5] Transactions of the Ophthalmological Society, 1904, p. 275.
[6] PROGRESSIVE MEDICINE, June, 1903, p. 359.

If the ulcer were situated in the central part of the cornea, or the margin toward the centre, or were situated near the periphery, he has found that cases in which straight, diverging, grayish lines radiated from all parts of the margin of the ulcer, did well under simple treatment, such as boric acid fomentations, and instillations of atropine. When these grayish linear opacities were seen at a part of the margin of the ulcer, he resorted to simple treatment, and often found that they developed from all parts of the margin, and the farther progress of the ulcer was arrested. Kipp's observations remind us that corneal ulcer, like other diseases, may be self-limited. This fact, often overlooked, may account for the large number of plans of treatment for corneal ulcer that have found favor and advocacy in the last few years.

Under the name *infectious marginal ulcer* of the cornea, zur Nedden some years ago described a form of ulcer and a bacillus which he thought caused it, but which does not seem to produce lesions of the conjunctiva. He has now[1] reiterated his views, believing them confirmed by 43 cases,

FIG. 47.



Cases of infectious marginal ulcer of the cornea. (ZUR NEDDEN.)

of which he gives sketches of the corneal lesions. Some typical forms from his collection are herewith reproduced.

It is notable that many of them show what may be taken to represent the gray, radiating lines described by Kipp. Although the ulcer may be accompanied by hypopion the prognosis is generally favorable. Zur Nedden usually treated these ulcers with atropine and a solution of mercury oxycyanide (1:5000), though sometimes the cautery or the Saemisch incision were resorted to.

For the *treatment of corneal ulcers* Gifford[2] regrets the tendency to speak slightingly of the Saemisch cut. For cases that are not desperate he scrapes the ulcer and applies one of the milder caustic acids. In this connection he speaks favorably of trichloracetic acid, used with just enough water to cause it to deliquesce. But for desperate cases he adds a cut through the floor of the ulcer, reopened every twelve hours, or kept open by cauterizing the edges, until the progress of the ulcer is surely stopped. He also recommends the Paquelin cautery, believing it pene-

[1] Graefe's Archiv f. Ophthalmologie, Bd. lix. p. 360.
[2] Ophthalmic Record, March, 1904.

trates more deeply than the galvanocautery often does. He suggests that the cheap apparatus used for pyrography answers the purpose admirably.

For infected corneal ulcers, V. T. Churchman[1] has employed subconjunctival injections of formalin solutions. Commonly he used 20 minims of a 1:1000 solution. After touching the conjunctiva with cocaine to render it insensitive at the point of entrance, the needle is introduced 6 to 10 mm. back from the corneal margin, one-half of the amount is injected above the cornea, the needle shifted, and the reminder injected below the cornea. He reports 18 cases treated by this method, some of which had been doing very badly until it was resorted to. Improvement was prompt in all cases, and in only a few was a second injection necessary.

Dendritic Keratitis. From an extensive study of the literature, Charles[2] infers that dendritic keratitis is due to a terminal nerve lesion. He points out that it has been observed most frequently in diseases especially prone to attack the nervous system. The herpetic form, which is vesicular in the beginning, he considers the expression of a descending neuritis. A second form caused by malaria, la grippe, etc., papular in the beginning, may be due to a purely peripheral nerve lesion. It may be a result of degeneration of the terminal filaments of the corneal nerves.

Evidences of such an origin of dendritic keratitis are anæsthesia of the part, which is rarely absent, and the shape of the lesion, which resembles the arrangement of the nerve fibres in the subepithelial plexus. In the beginning the lesion is never deeper than Bowman's membrane, although later it extends sufficiently to leave a scar. In the malarial cases, in which quinine seems to hasten the recovery, this may be by checking the progress of degeneration before Bowman's membrane is injured. Any poison would be more likely to affect portions of the nerves farthest removed from the source of food supply.

Corneal Infiltration. Hot water has been applied in various ways in the treatment of corneal infiltrations, including the dropping of almost boiling water upon corneal ulcers. Manolesco[3] states that the dropping of very hot water into the conjunctival sac is the best treatment for parenchymatous keratitis, and deep corneal infiltration from other causes. After cocainization the water should be dropped in at a temperature of 70° to 80° C. (158° to 176° F.). Even somewhat hotter than this it will do no serious harm. It is to be dropped in for five or ten minutes. The application is followed by increased redness, which lasts for some hours.

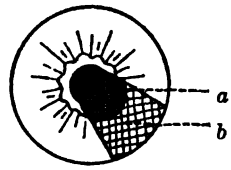
Deposits of Silver and Lead. Weeks[4] reports a case of a deposit of silver in the cornea causing an almost black plaque, 5 mm. in diameter, having

[1] Transactions of the West Virginia State Medical Association, 1904.
[2] American Journal of Ophthalmology, April, 1904.
[3] Annales d'Oculistique, March, 1904.
[4] New York Eye and Ear Infirmary Reports, January, 1904.

a metallic lustre. Its lower margin was bordered by an opaque, grayish, or yellowish-white border. The ocular conjunctiva was deeply injected, the eye painful, and vision reduced to perception of light. The patient had been given a solution of cocaine muriate to be instilled into the eye every two hours, this to be followed by instilling 1 or 2 drops of a 1 per cent. solution of silver nitrate. This was kept up for sixteen hours. Under the use of bichloride vaselin (1:5000) the plaque slowly diminished. A portion scraped away contained silver, probably in a finely divided metallic state. The eye became quiet, but an opacity remained reducing vision to counting fingers.

An extensive lead incrustation of the cornea is reported by Terson.[1] Iridectomy had been done for it, and tattooing of the cornea proposed. Terson removed the film by scraping, in three sittings, improving vision from $\frac{1}{10}$ to $\frac{1}{4}$.

FIG. 48.



Elschnig's method of cauterizing the cornea for keratoconus: *a*, deep cauterization of the apex; *b*, superficial burn extending to corneal margin.

Schiele[2] has succeeded in removing such an incrustation by changing the lead into a soluble salt. The film was first touched with a 3 per cent. to 5 per cent. solution of potassium iodide, then with a solution of equal strength of iodic acid. This causes the formation of nascent iodine, which attacks the insoluble lead salt, giving rise to a soluble compound, lead iodate. The irritation produced by the application also causes a leukocytosis which assists in the removal of the film.

Conical Cornea. It is pretty well agreed that the use of the cautery for extreme cases of conical cornea is the safest and most effective means of producing flattening of the apex of the cone. Repeated cauterization has been recommended, and this Scalinci[3] employs. He endeavors to burn more deeply at each cauterization; going on to perforation. He insists that the apex must be cauterized to get a permanent result.

Elschnig[4] reports that he can almost always succeed by one application in producing permanent flattening. He uses the cautery in the following way: The cautery is brought only to a dull red heat. It is applied to the

[1] Recueil d'ophtalmologie, December, 1904.
[2] Wochenschr. f. Therap. u. Hygiene des Auges, May 19, 1904.
[3] Annali di Ottalmologie, Bd. xxxiii. p. 81.
[4] American Journal of Ophthalmology, June, 1904.

apex of the cone and also to a strip of tissue extending from the apex to the nearest part of the sclerocorneal margin. This produces a band of vascular tissue extending to the apex of the cone and ensures the continued shrinking of the scar and flattening of the cornea. The apex of the cone is usually eccentric. If it were not so the scar should be made slightly eccentric to leave some clear cornea in front of the pupil.

DISEASES OF THE UVEAL TRACT.

Iritis: Size of Pupil. Contraction of the pupil is the symptom usually mentioned in text-book descriptions of iritis. Herbert[1] states that in his experience in India quite half the cases, presumably untreated by mydriatics, show a slight enlargement of the pupil, as compared with that of the unaffected fellow eye in distant fixation in ordinary daylight.

The enlargement seems to occur chiefly in severe cases when corneal irritation is absent. Slight corneal lesions are attended with contraction of the pupil which may persist until the iris is bound down in this position.

TREATMENT: SUBCONJUNCTIVAL AND TEMPORAL INJECTIONS. In the treatment of iritis, Roy[2] has employed injections under the conjunctiva and under the skin of the temple. He thinks they should be resorted to in all cases of severe iritis. For *rheumatic iritis* he used 7 centigrams (1 grain) of lithium salicylate, dissolved in 6 or 8 drops of sterilized water to which 4 mgm. ($\frac{1}{16}$ grain) of cocaine hydrochlorate was added to lessen the severe pain caused by the subconjunctival injection. For *syphilitic iritis* he used 6 to 8 drops of sublimate solution, 1:2000, with a similar addition of cocaine. After making the subconjunctival injection, if there were severe orbital pain a similar injection was made under the skin of the temple.

This treatment was not intended to replace internal medication and the local use of mydriatics, but by it Roy was able to control and relieve the pain of iritis within two or three days, the injection being repeated once daily. He reports a series of 4 cases of acute iritis none of which required more than two injections. In a case of chronic iritis, five injections were employed at intervals of eight to ten days, with excellent effect.

Foucher[3] used subconjunctival injections of sodium salicylate in three cases. He injected 6 drops of a 1 per cent. solution. In a fourth case, instead of making injections under the conjunctiva, he made it under the skin of the temple, and obtained an equally good result.

[1] Ophthalmoscope, September, 1904.
[2] Annales d'oculistique, September, 1904, p. 206.
[3] L'ophtalmologie provinciale, August, 1904.

Gummatous Iritis. In gummatous iritis the breaking down of small gummata in the iris gives rise to yellowish débris that settles at the bottom of the anterior chamber, causing an appearance closely resembling hypopion. Rollet[1] reports two cases in which this form of iritis arose in six to nine months after the primary lesion. In such cases the prognosis seems to be distinctly favorable.

Krueckmann[2] has employed *kataphoresis* for the local application of mercury to the eye in gummatous iritis. He advises the employment of a current not exceeding 1½ milliamperes for daily sittings of twenty to forty minutes each. He has used in the mercurial solutions, sublamin 1:3000, or the succinimide of mercury 1:4000.

Tuberculous Iritis. The negative results with a new method of treatment have quite as much importance in fixing its true value as the positive. Heath[3] reports complete failure to check the course of iritic tuberculosis by weekly injections of air into the anterior chamber, as recommended by Koster.[4] It should be noted, however, that Heath's case was one of hopeless general tuberculosis rapidly approaching the fatal termination. Probably it is true of all forms of ocular tuberculosis, as was pointed out last year regarding conjunctival tuberculosis, that they improve or grow worse with the general condition of the patient.

The importance of constitutional treatment is emphasized by the observations of Meissonnier,[5] who points out that the tuberculosis may first affect the ciliary body and subsequently extend into the iris. He believes that uveal tuberculosis is always secondary.

Hunter[6] reports a case in which a child, with bad family history and unsanitary conditions of life, as might be expected, grew worse. Pollack[7] reported one of similar character terminating in enucleation for the pain. Abadie[8] takes a more favorable view, reporting two cases to sustain it; but he attaches great importance to internal treatment, including iodine preparations, cod-liver oil, guaiacol, and raw meat.

Radium for Uveitis. A case of severe relapsing uveitis, for which one eye had been enucleated and the second eye greatly improved under application of radium, is reported by Williams.[9] The exposures to the radium were made three times a week, with occasional intermissions of a week, up to the number of thirty. Practically no other treatment was

[1] Revue générale d'ophtalmologie, October, 1904.
[2] Zeitschrift f. Augenheilkunde, January, 1904.
[3] Ophthalmic Record, May, 1904.
[4] Progressive Medicine, June, 1903, p. 373.
[5] Archives d'ophtalmologie, July, 1904.
[6] New York Eye and Ear Infirmary Reports, 1904, p. 7.
[7] Glasgow Medical Journal, February, 1904.
[8] Archives d'ophtalmologie, March, 1904.
[9] Transactions of the American Ophthalmological Society, 1904, p. 269.

used. Vision improved from counting fingers at ten feet to $\frac{6}{6}$. This single case would have less importance if the fact had not been rather frequently observed that the application of *x*-rays greatly relieved pain and favorably modified the course of uveal inflammations. I have seen a case of traumatic uveitis, that had persistently done badly under ordinary treatment, immediately improve after the application of the *x*-ray. Enucleation, which had previously been considered necessary, was not done, and the eye became painless, white, and quiet. It seems probable that the physiological and therapeutical effects of radium depend on the part of its radiations corresponding to the *x*-ray.

Central Superficial Choroiditis. A case of the so-called Tay's guttate choroiditis is reported by Schneideman.[1] This case began with a central relative scotoma. The ophthalmoscopic changes became decidedly noticeable in the region of the macula only after several months. At first there were slight swelling and a deeper color of the macula; later, yellowish-white plaques appeared in this region which remained permanent, although vision rose again to the normal standard.

Roosa[2] reports a case in which similar blurring of vision, with haziness of the vitreous, and subsequently spots of choroidal atrophy, occurred. The trouble began after ten hours' continuous reading of fine type. Vision remained reduced.

Panophthalmitis. A case of bilateral *metastatic panophthalmitis* is reported by Zobel,[3] in a patient suffering from a right-sided pneumonia. Two days after the crisis the left eye became inflamed, and three days later the right. The patient died. At the autopsy a suppurating bronchial gland was found to have broken into the right pulmonary vein, and metastases were found in other organs. Pneumococci were discovered in large numbers in the eyes, and pure cultures were obtained.

Alcohol Compresses. Schiele[4] believes that he has greatly diminished the pain of panophthalmitis and lessened its duration by compresses soaked in absolute or 96 per cent. alcohol. These were renewed every twelve hours. At first the patients experienced a slight burning, but there was no excoriation of the skin. Phthisis bulbi was not prevented, but the eyes became quiet more quickly under this plan of treatment.

[1] American Journal of Ophthalmology, January, 1905.
[2] Medical Record, February 20, 1904.
[3] Zeitschrift f. Augenheilkunde, January, 1904.
[4] Wiener medizinische Presse, September 18, 1904.

SYMPATHETIC DISEASE.

Sympathetic Amblyopia. Nuel,[1] from the prolonged observation of twenty cases, attempts to characterize this condition. He gives it a place between traumatic neuroses and true sympathetic ophthalmia. Momentary obscurations of vision are complained of many months after the injury to the exciting eye. Visual acuity is slightly diminished and narrowing of the visual field may be found. Sometimes a slight photophobia exists. Later the visual acuity fails and the visual field becomes decidedly narrowed. In bad cases slight changes may be noted in the optic disk and retinal veins. The exciting eye usually remains quiet. The disease does not go on to total blindness. Nuel advocates rest, smoked glasses, and mercurial inunctions. Enucleation of the exciting eye does not have the same good effect as in the other forms of sympathetic disease.

Sympathetic Inflammation. A new theory of sympathetic ophthalmia was suggested by Brown Pusey.[2] He took the observation that when one kidney was made to undergo degeneration by tying its ureter and vessels, the other kidney also underwent degenerative changes, which did not occur if the first kidney had been excised. From this he reasoned that cells in the ciliary region of an injured eye might produce toxins which passed through the circulation to corresponding cells in the other eye and set up a sympathetic uveitis.

Golovine[3] propounds much the same theory, extending its possible application to other than recognized sympathetic diseases. The theory is a very interesting and suggestive one, but the experiments so far made by both of its propounders seem to have yielded negative results. Motais[4] points out a possible channel for the transmission of sympathetic disease from the exciting to the sympathizing eye through the ophthalmic veins of the two sides, which are in full communication both anteriorly and posteriorly, and are not furnished with valves.

Leber,[5] reviewing the evidence of the connection of micro-organisms with sympathetic inflammation, inclines to the view that they pass to the sympathizing eye through the blood stream. But he brings forward no new or convincing evidence on the subject.

Sympathetic Ophthalmia following Panophthalmitis is reported by Ahlstroem.[6] The bacteriological examination of the sympathizing eye showed staphylococci in the vitreous, retina, and choroid, but not in the bloodves-

[1] American Journal of Ophthalmology, July, 1904.
[2] Archives of Ophthalmology, July, 1903.
[3] Roussky Vratch, May 29, 1904.
[4] Transactions of the Tenth International Congress, Lucerne, 1904.
[5] Graefe's Archiv f. Ophthalmologie, Bd. lviii. p. 324.
[6] Centralblatt f. Augenheilkunde, July, 1904.

sels, optic nerve, or perineural space. Ahlstroem also reports a case of sympathetic ophthalmitis in which the sympathizing eye began to improve after a severe attack of African malarial fever. As enucleation had been promptly done, and as a relapse occurred after recovery from the fever, the share of the intercurrent disease in promoting a cure seems doubtful.

An interesting case of sympathetic inflammation following enucleation with implantation of a glass globe is reported by Sattler.[1] Recovery occurred after removal of the glass globe, and resection of the optic nerve trunk which was found embedded in dense cicatricial tissue.

DISEASES OF THE RETINA.

Hemorrhage. In searching for a cause for congenital amblyopia, Coburn[2] was led to study the eyes of 37 infants, stillborn or dying within twenty-two days after birth. Among these he found 17 that had suffered hemorrhage into the eye. In all cases the retina was the chief site of extravasation. Hemorrhage into the head of the optic nerve was noted 4 times; into the nerve sheath, 5 times; subretinal effusion, 3 times; subhyaloid, 4 times. The hemorrhages were most frequently found in the equatorial part of the eye.

Coburn points out that the proportion of cases of hemorrhage is probably not so large in children that survive, but he quotes from different authors who have examined the eyes of newborn children with the ophthalmoscope. In an aggregate of 673 cases hemorrhage was found in 127, or 20 per cent. Coburn points out how the conditions of labor favor the engorgement of all parts of the head, especially after the head has been born. Four-fifths of the eyes of newborn infants showed the vessels engorged, even where there had been no extravasation.

In the great mass of cases the blood is absorbed without leaving any trace, but it is quite possible for it to cause injury that would produce permanent amblyopia. The danger of retinal hemorrhage should be borne in mind and should influence the management of cases of labor. Probably cases of retinal hemorrhage from compression of the thorax, of which an example from compression between the buffers of cars, is reported by Scheer,[3] arise under much the same conditions as these birth hemorrhages.

Hemorrhage in Tape-worm Anæmia. In six cases of pernicious anæmia produced by *bothriocephalus latus*, Tschemolossow[4] found this a constant

[1] Transactions of the American Ophthalmological Society, 1904, p. 337.
[2] Archives of Ophthalmology, May, 1904.
[3] Graefe's Archiv f. Ophthalmologie, Bd. lix. No. 2, p. 311
[4] Die ophthalm. Klinik., 1904, No. 10.

symptom. The hemorrhages occur in the nerve-fibre layer of the retina chiefly near the posterior pole of the eye. Visual acuteness is usually unaffected. The hemorrhage resembles that seen in pernicious anæmia.

Diabetic Retinitis. A case in which retinal hemorrhage was the first symptom of diabetes mellitus is reported by Nagel.[1] The patient had an iridectomy made for acute glaucoma about a year before, showing no hemorrhagic tendency. Vision failing in the other eye, the ophthalmoscope revealed a number of small, roundish, pale-red, fresh retinal hemorrhages in the region of the posterior pole of the eye. There were no white spots in the retina. Examination of the urine then revealed 0.5 per cent. of sugar.

The prognostic and diagnostic significance of retinitis in diabetes is discussed by Nettleship.[2] He bases his conclusions on 48 cases. The patients ranged from forty-one to seventy-nine years, and 38 were known to have died—9 in the first year, 11 in the second year, and 18 between two and eight years after the discovery of the retinitis. Ten were known to have been living two years after such discovery, and 6 at periods of six to ten years afterward. The prognosis, therefore, differs widely from that of renal retinitis, since two-thirds of the patients were living two years after the retinal lesion was observed. Nettleship thinks that over half of these patients die of diabetes apart from any accompanying renal lesions. The character of the retinal lesions is less uniform in diabetes than in chronic nephritis; still they are of much assistance in diagnosis. The retinal degeneration may go on even though the general condition of the patient improves. The prognosis of improvement of vision, therefore, should be very guarded.

Renal Retinitis. The pathological anatomy of renal retinitis has been studied in 5 cases by Opin and Rochon-Duvigneaud.[3] They found the retinal lesions localized chiefly at the posterior pole of the eye, and to consist principally of œdema, hemorrhage, and fibrinous infiltration. The essential retinal structures were seldom destroyed. They found vascular changes more frequent in the choroid than in the retina. Except the heart and kidneys, other organs were unaffected.

Bichelonne[4] reports as albuminuric a case of neuroretinitis due to a chill followed by excessive use of the eyes in working upon annual accounts for two days and two nights. The patient had complained of lumbar pain some weeks before this. Traces of albumin were found in a few specimens of urine, but most examinations of the urine showed none. The retinal lesions were not those characteristic of renal retinitis. The patient had

[1] Ophthalmic Record, October, 1904.
[2] Royal London Ophthalmic Hospital Reports, vol. xvi. No 1, p. 11.
[3] Archives d'ophtalmologie, March, 1904.
[4] Annales d'oculistique, December, 1904.

between 2 D. and 3 D. of hyperopia. The case seems to illustrate the fact that eye-strain neuroretinitis may be mistaken for that due to renal disease. It may serve also as a reminder that the more acute forms of renal retinitis are often largely due to eye-strain, and may greatly improve after the removal of that factor.

DISEASES OF THE OPTIC NERVES, TRACTS AND CENTRES.

Optic Neuritis: Pseudoneuritis. In certain cases it is difficult or impossible to say on first examination whether the ophthalmoscopic appearances indicate optic neuritis, or merely an anomaly of the nerve head. Pick[1] divides these cases into pseudoneuritis and œdema. The diagnostic points to which he calls attention are: transparency of the tissue, the normal reflex from the vessels, the permanence of tortuosity of the vessels, and the refraction. I would emphasize the permanence of the appearances when not due to optic neuritis and the absence of the "choking" of the retinal vessels—that is, narrowing of the arteries and enlargement of the veins. Pick points out that when the hyperæmia of some infectious fever is added to the usual appearances of pseudoneuritis, the diagnosis becomes still more difficult. Only time, revealing the changes of optic neuritis or the absence of such changes, can make it certain.

The differentiation of pseudoneuritis is of greater importance because true optic neuritis does occur with the acute infectious fevers. Flatau[2] reports a case of paratyphoid with optic neuritis. Carpenter[3] reports two cases of optic papillitis occurring with enteric fever in children seven and eleven years of age.

Bichelonne[4] reports one of angina followed by double optic neuritis, and Bar[5] a case of optic neuritis with polyneuritis occurring during pregnancy. Fergus[6] met a case of optic neuritis following smallpox.

Regarding *blindness from optic neuritis*, Barrett[7] finds that in non-syphilitic cases, and even in many syphilitic cases, blindness will result, if the case be allowed to run its course. He believes that a simple opening in the skull gives better prospect of saving vision and relieving pain than any form of medical treatment, and that we should not wait until vision begins to fail before resorting to this.

Optic Atrophy following Severe Hemorrhage. The amaurosis which sometimes follows severe hemorrhage seems to be due to atrophy of the

[1] Zeitschrift f. Augenheilkunde, March, 1904.
[2] Münch. med. Wochenschrift, July 5, 1904.
[3] The Ophthalmoscope, February, 1904.
[4] Annales d'oculistique, November, 1904.
[5] Bulletin de la societe d'obst., Paris, 1904, p. 180.
[6] Ophthalmic Review, July, 1904.
[7] Intercolonial Medical Journal of Australasia, 1904, vol. ix. pp. 249–258

optic nerves. Sweet[1] reported its occurrence in a previously healthy man of fifty-five years following severe intestinal hemorrhage. Stirling[2] reports one following hemorrhage from extraction of a tooth in a boy less than four years of age, who was evidently a "bleeder." In some of these cases the blindness is temporary. In many of them there is subsequently a little improvement; but optic atrophy becomes evident, and after that not very much can be done for them. The improvement of vision usually begins from three to six days after the occurrence of the hemorrhage.

Terson has urged the early treatment of these cases by large injections of saline solution, or of some artificial serum. He reports[3] a case of syncope from post-partum hemorrhage. The patient on regaining consciousness found herself blind. The physician in attendance gave a large saline injection, and vision was permanently restored.

Optic Atrophy and Cranial Deformity. Oxycephaly, or "tower skull," is a deformity which arises through early union along some of the sutures, leading to excessive height of the calvarium above the auditory meatus. It is apt to be attended by post-neuritic, or primary optic atrophy. Morax and Patry[4] report 7 cases, 6 of them from one institution for the blind containing 200 inmates. The blindness was not congenital, but began usually before the age of five years, although one patient was nine years old. In most cases the general intelligence was fair or good.

Enslin[5] has collected altogether 28 cases, 26 having been reported by others, not including the series above referred to. In most cases the optic atrophy was post-neuritic, although in a few it seems to have been a primary gray atrophy. The 3 cases examined post-mortem all showed narrowing of the optic foramen.

Enslin thinks that the osseous changes in this region are the cause of an optic neuritis, rejecting the suggestion of Hirschberg that this might be due to meningitis. The neuritis has usually passed into atrophy before the patient is seen; because, until atrophy begins, vision remains good and attention is not directed to the eyes.

Diseases of the Optic Chiasm. These have received special attention in the literature of the past year, notable articles having been published by Wilbrand and Saenger,[6] de Schweinitz and Carpenter,[7] and Gehrung.[8] The latter gives, by brief abstract and table, 102 cases that he has collected, most of them from the literature. He finds that disease of the chiasm may be due to acromegaly, syphilis, tuberculosis, meningitis,

[1] Transactions of the American Ophthalmological Society, 1903.
[2] Ophthalmic Review, August, 1904.
[3] Recueil d'ophtalmologie, July, 1903. [4] Ibid., August, 1904, p. 480
[5] Graefe's Archiv f. Ophthalmologie, Bd. lviii. Heft 1, p. 151.
[6] Die neurologie des Auges, Bd. iii.
[7] Journal of the American Medical Association, January 14, 1905.
[8] New York Eye and Ear Infirmary Reports, 1904.

sarcoma of various kinds, carcinoma, endothelioma, enchondroma, adenoma, glioma, aneurysm, cysts, fracture of the skull, ascending neuritis, hemorrhage, and hypertrophy of the pituitary body. From the comparatively small number of reported cases he infers either that the chiasm is not a favorable site for lesions in these various diseases, or that many cases go unrecognized. De Schweintz and Carpenter also call attention to lesions of the chiasm occuring with multiple sclerosis and tabes.

The most important ocular symptoms of chiasm disease are the changes in the visual field. Bitemporal hæmianopsia, from destruction of the fibres which cross at the chiasm is the most characteristic, but cases in which the lesion is exactly limited to these fibres are very rare. Generally it encroaches either upon one tract, causing homonymous defect of the fields in both eyes; or upon one nerve, causing greater impairment of the field in one eye. More extensive disease involving both the direct and decussating tracts at the chiasm may cause complete blindness in both eyes.

It is to be noted that in bitemporal hemianopsia the division between the blind and seeing halves of the fields is found, as in homonymous hemianopsia, to pass slightly toward the blind side, leaving the fixation point fairly within the seeing field. Anomalous disturbances of the visual field, such as loss of the temporal color fields, central scotoma, sector defects, and even homonymous and nasal hemianopsias, are also reported as due to disease of the chiasm.

For the differential diagnosis of chiasm disease it must be remembered that, as de Schweinitz and Carpenter point out, these disorders of the field of vision may be simulated by hysterical hemianopsia, by the effects of brain tumor situated at a distance from the chiasm, by irregular contraction, involving chiefly the temporal fields in tabetic atrophy of the optic nerve, and possibly by some of the toxic amblyopias.

The ophthalmoscopic symptoms of chiasm disease include optic neuritis and optic atrophy. The atrophy may be primary, or it may be postneuritic. It may involve only the temporal half of the nerve entrance. Loss of reaction of the pupil to light thrown upon the blind half of the retina, which theoretically should be common, has been noted in a few cases.

Congenital Word Blindness. While little has been added to the clinical picture of this condition drawn by Hinshelwood and Nettleship,[1] additional cases have been reported from different parts of the world, until, including new cases within the last year by Hinshelwood[2] and Brunner,[3] and 2 which I have reported in a paper read before the Denver Academy of Medicine, 19 cases are now on record.

[1] PROGRESSIVE MEDICINE, June, 1902, p. 381.
[2] The Ophthalmoscope, October, 1904.
[3] Ophthalmology, January, 1905.

The influence of sex is shown by the proportion, 15 boys to 4 girls. So far only two patients are known to have reached adult life without acquiring moderate ability to read. The defect seems to some extent to be merely a delayed development and probably the lower degrees of it are not uncommon. Whether, as has been supposed, it is always due to absence or deficiency of a centre for the visual memory of letters and words, a centre usually situated in the left angular gyrus, seems still uncertain. The difficulty of reading may extend to the reading of numerals, or this may be quite perfect.

Recognition of the condition would be difficult in children with inferior general intelligence or imperfect vision. So far all recorded cases have been recognized by ophthalmologists to whom they were brought on the supposition that the difficulty was really a defect of vision, but in every case the vision proved to be fully up to the normal standard.

TOXIC AMBLYOPIAS.

Methyl-Alcohol Amblyopia. The importance of methyl-alcohol poisoning is as yet imperfectly recognized by the medical profession and the public. Cases of blindness from this cause may now usually reach a correct diagnosis. The clinical history[1] of sudden blindness followed by marked improvement and subsequent relapse, is so striking and characteristic, and after reaching blindness the patients are so likely to consult a number of specialists, that probably few cases of amblyopia from this cause pass unrecognized. Cases that end in death, and so are subjected to judicial investigation, are also frequently traced to the proper source; but it is to be feared that the great mass of cases which do not result in death or permanent blindness are still ascribed to other causes.

Buller and Wood[2] have attempted to collect both reported and hitherto unreported cases. They have thus brought together 153 instances of blindness and 122 deaths from methyl-alcohol occurring within the last few years. These do not include the somewhat sensational revelations in New York, where 25 deaths were traced to the drinking of wood-alcohol from one saloon.

The extent of the danger from this cause is indicated by quotations from health officers. Thus, in the opinion of Dr. Wylie, of the Government Bureau of Chemistry, "85 per cent. of the whiskey sold in this country in hotels, restaurants, clubs, and bars is nothing less than a cheap imitation." Dr. Warren, Pure Food Commissioner of Pennsylvania, states that of 1000 samples of cheap whiskey 95 per cent. con-

[1] PROGRESSIVE MEDICINE, June, 1903, p 390.

[2] Journal of the American Medical Association, October 1, 1904.

tained wood-alcohol, some as high a proportion as 75 per cent. The drinking of this drug either as cheap whiskey, or as one of the cheap extracts, is actually coming to be one of the more serious causes of blindness, and until a wider appreciation of its danger is brought about, and radical measures are taken to prevent the drinking of this poison, the proportion of blindness due to this cause will certainly increase.

Tobacco Amblyopia. The characteristic symptom of tobacco amblyopia is the central scotoma, and usually no other impairment of the visual field is thought of in connection with it. Other abnormalities have been noticed, and Harman[1] believes they are quite constant. He studied his cases by taking the fields of vision first in a fully-lighted room, and then taking the field for white by a comparatively feeble illumination. By this means he discovered peripheral narrowing and impaired vision throughout the whole extent of the field. In 4 cases, followed to recovery, enlargement of the fields coincided with improvement of central vision, and in relapses diminution of the field accompanied diminished visual acuity.

Pathology of Toxic Amblyopias. In an experimental study of the nature of *quinine amblyopia*, Altland[2] found changes in the retinal ganglion cells in animals killed during quinine intoxication even when there were no ophthalmoscopic changes and no evidences of impaired vision. If visual impairment and ophthalmoscopic changes (pallor of the disk and narrowing of the arteries) were produced the alterations in the ganglion cells were much greater. The bloodvessel walls exhibited no anatomical changes. Altland believes that the amblyopia is due to the direct action of the quinine on the ganglion cells, although their necrosis may be hastened by the diminution of the blood supply.

Birch-Hirschfeld[3] argues at length against the view of Schieck that the *amblyopia produced by ethyl-alcohol* depends primarily upon disease of the vessels of the optic nerve, the diminished blood supply being most severely felt by the centrally situated fibres. He points out that the vascular alterations are far from constant, and argues that in the absence of anatomical studies of early amblyopia from ethyl-alcohol, weight should be given to the observed early results of poisoning by methyl-alcohol. Birch-Hirschfeld holds out that the direct influence of the toxic agent upon the optic nerve fibres and ganglion cells cannot be disproved, although he does not deny that changes may occur in the bloodvessels of the optic nerve, and may possess a certain significance.

[1] Lancet, October 1, 1904.
[2] Klinische Monatsbl. f. Augenheilkunde, July–August, 1904.
[3] The Ophthalmoscope, March, 1904

DISEASES OF THE CRYSTALLINE LENS.

Causation of Cataract. Attention is called by Calhoun[1] to the association of *cataract with uncinariasis*. He gives 5 cases seen within one year which strikingly illustrate this connection, and he remembers others of the kind encountered before his attention was called to the subject. The ages of his patients were suggestive of some unusual cause for cataract. They were fourteen, sixteen, forty, forty-two and forty-three years. The cataract was in every case bilateral and had developed from several months to a year after the appearance of symptoms of uncinariasis. Every examination of the feces showed the eggs of the hook-worm. This disease seems to be quite common in our Southern States, being frequently confused with malaria. Other evidences of its tendency to cause cataract should soon be forthcoming.

Influence of Osmosis on Cataract. The urine of 80 patients suffering from cataract in Parisotti's clinic has been studied by Grilli[2] by the method of *cryoscopy*. He found the osmotic tension low, averaging 1.10, while that of a number of healthy persons averaged —1.65. This approach of the freezing point of the urine toward that of distilled water indicates deficient elimination. Grilli thinks this due to what has been called "senile kidney," probably caused by arteriosclerosis affecting the kidney, although other parts of the arterial system may show little evidence of such a change. The effect of deficient elimination is probably an increased osmotic tension in the fluids surrounding the crystalline lens—the aqueous and vitreous humors—which tends to withdraw water from the lens and produce opacity. Grilli[3] reports from the clinics of Galezowski and Landolt 3 cases of cataract in patients aged forty-two, forty and forty-six years, who were suffering from chronic lead-poisoning. In these patients also the osmotic tension of the urine was low, —1.02, —1.13, —1.20.

Brown Pusey[4] studied the possible effect of osmotic disturbances in causing glaucoma by suspension of the eye in fluids (sodium chloride solutions or alcohol dilutions) having different osmotic tensions. He observed that a solution with a high osmotic tension caused the lens to become opaque, in from one and a half to two and a half hours; but upon leaving the lens in distilled water or a solution of low osmotic tension for some hours it again became clear.

For some years I have told patients suffering from incipient senile cataract that to favor elimination by drinking freely of water, and to avoid eye-strain, were the most important things they could do to check or

[1] Ophthalmic Record, April, 1904.
[2] Recueil d'ophtalmologie, June, 1904.
[3] Ibid., October, 1904.
[4] Archives of Ophthalmology, March, 1904.

prevent the development of cataract. In many cases there has been no further increase of the opacity, and in several cases there has been partial clearing of the lens.

Salffner[1] found that in experimental naphthalin cataract produced in dogs the weight and the volume of the crystalline lens were both reduced, while its specific gravity was increased. Peters[2] found in naphthalin cataract an increased proportion of salts and increased osmotic tension in the aqueous humor.

GLAUCOMA.

Medical Treatment. The unwillingness of patients to submit to the most effective treatment for glaucoma, iridectomy, leaves many cases to be met as best they can by other measures. Cantonnet[3] has used *sodium chloride internally* to increase elimination. After careful estimation of the chlorides excreted, the patient was given 3 grams daily, and the dose increased, sometimes to 15 grams per day. When the amount of chlorides excreted increased about as much as the amount given, and polyuria was produced, the treatment was considered appropriate. In 17 cases thus treated the effect was reported excellent in 6, and good in 6 others; in 3 the results were distinctly bad. If renal elimination be defective this treatment should be avoided.

Bessonnet[4] reports a trial of *strophanthus* for glaucoma, as recommended by Zimmermann. In 2 cases presenting the "prodromes of glaucoma" decided improvement was experienced. In 6 cases treated with myotics and strophanthus there was notable improvement for two or three weeks. In one case the disease seemed to be seriously aggravated. Bessonnet concludes that this treatment is not suited to all cases, but may be of benefit to some.

Darier,[5] in a case where one eye had been lost by hemorrhage complicating iridectomy, used subconjunctival injections of sodium iodate solution, 1: 1000. The tension of the eye was promptly reduced, but contraction of the visual field still continued.

Sympathectomy. Loring[6] has collected the reported cases of simple glaucoma for which this operation has been done. He finds 41 eyes (33 patients), of which 29 eyes were improved for three months or more, but only 8 eyes had been under observation so long as one year and none more than two years. He concludes that for glaucoma simplex sympathectomy is justifiable and ought to be more often tried, when the disease continues to progress in spite of other measures.

[1] Graefe's Archiv f. Ophthalmologie, Bd. lix. Heft 3, p. 520.
[2] Klinische Monatsbl. f. Augenheilkunde, July–August, 1904.
[3] Archives d'ophtalmologie, January, 1904.
[4] Recueil d'ophtalmologie, August, 1904.
[5] Ibid., December, 1904
[6] Archives of Ophthalmology, September, 1904.

Henderson[1] reports 2 cases of bilateral glaucoma subjected to bilateral sympathectomy. The course of the disease was permanently checked, in one for over four years, in the other for five months. He concludes that the operation should be done for simple chronic glaucoma as soon as possible after the diagnosis is made, and that "both superior cervical ganglions should be removed at the same time." He points out that of Loring's cases 12 had bilateral sympathectomy, and that in these patients 18 eyes improved after the operation, without reported relapse; while 4 improved, but subsequently relapsed.

Bilateral sympathectomy is apparently as free from injurious effects as unilateral. In view of the extremely intimate relations between the sympathetic nerves of the two sides a unilateral operation may be regarded as a partial or incomplete operation. And in view of the indications furnished by the limited clinical experience yet at our disposal, I believe it is proper in all cases where sympathectomy is advised to urge that the superior ganglion be removed on both sides.

OCULAR DISEASE WITH DENTAL DISEASE.

Reber[2] classifies the cases falling under this heading into (1) purely functional; (2) functional inflammatory (ocular inflammation from dental irritation); (3) inflammatory; (4) dental neuralgia due to ocular anomalies or disease. In the first class the most common condition is impairment of the accommodation. Cases of reflex amaurosis have also been reported. Under this heading Reber reports a case in which blurring of vision, dilatation of the pupil, and failure of its reaction to light followed the extraction of an upper bicuspid tooth. Other evidences of traumatic hysteria developed. In the second group are classed cases of glaucoma, neuroparalytic keratitis and uveal inflammations, apparently due to dental irritation and relieved by its removal. In the third group are placed those not very rare cases in which alveolar inflammation extends (often by the antrum of Highmore) to the walls or contents of the orbit. In his fourth group Reber mentions the pain of iritis felt as a toothache. But the larger number of cases are those in which the toothache seems to be set up by eye-strain, from ametropia, excessive near work for the eyes, or exophoria with near work.

Nance[3] reports cases of asthenopia due to an unhealthy cavity in an upper molar, supraorbital neuralgia, loss of accommodation and hyperæmia of the eye from diseased upper teeth; and one of inflammation extending from the socket of a decayed upper molar and causing orbital abscess.

[1] Annals of Ophthalmology, January, 1905. [2] Ophthalmology, October, 1904
[3] Journal of the American Medical Association, April 2, 1904.

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